Introduction

Healthy Eating and Physical Activity

Healthy, age-appropriate eating and physical activity are essential for good health at every age. Both are especially important for the growth and development of infants, children, and adolescents. Healthy eating can help prevent health problems such as iron-deficiency anemia, eating disorders, undernutrition, dental caries (tooth decay), overweight and obesity, and osteoporosis. Healthy eating along with physical activity can help prevent overweight and obesity and osteoporosis. Over the long term, healthy eating and physical activity can help lower the risk of developing chronic diseases (eg, heart disease, certain cancers, type 2 diabetes mellitus, stroke, osteoporosis) or reduce risk factors for diseases (eg, overweight and obesity, high blood pressure, high blood cholesterol levels).[1] Physical activity in children and adolescents also improves strength and endurance, builds healthy bones and lean muscles, develops motor skills and coordination, reduces fat, reduces feelings of depression and anxiety, and promotes psychological well-being.[2] Many children and adolescents like physical activity because it is fun; they can do it with friends and family; and it helps them learn skills, stay in shape, and feel good. By making healthy food choices and finding a balance between the amount of food they consume and the level of physical activity they engage in, they can feel good and stay healthy.[1,2]

Unfortunately, there are barriers to both healthy eating and being physically active. High-calorie, low-nutrient foods are widely available, and portion sizes are often large. These foods, which require little or no preparation and are frequently inexpensive, are attractive to families facing time and money pressures. In addition, many media messages encourage unhealthy eating, thereby negatively influencing children's and adolescents' eating behaviors. Too often, "healthy eating" connotes expensive food that is tasteless, time-consuming to prepare, and part of a regimented "diet" that is inconsistent with usual eating habits.

Similarly, negative images create barriers to being physically active. Physical activity is sometimes viewed as time-consuming, painful, boring, or expensive. Some people feel they can't be physically active on a regular basis, so they don't try to be physically active at all. Children and adolescents who are sedentary often feel that physical activity goals are beyond their reach, and others feel intimidated about joining activities with those who are more fit or athletic. Furthermore, some families have difficulty finding safe, inexpensive places where they can enjoy physical activity.

Health professionals, families, and communities can work together to improve the well-being of children and adolescents by creating opportunities for healthy eating and physical activity. Multifaceted, community efforts can combat negative images and demonstrate that healthy foods can be tasty, quick to prepare, and affordable and that physical activity can be fun. Using settings such as community centers, athletic facilities, libraries,

restaurants, and grocery stores to deliver innovative nutrition-education programs should be explored. Environments that make it easier to be physically active should be provided. Examples of such environments include parks with play areas, walking and biking paths, and school and other community recreational facilities that are open during nonschool hours (eg, after school, on weekends, during the summer). Providing families with healthy food choices that are appealing and affordable, as well as with options for becoming more physically active, can empower all family members to develop healthy lifestyles.

People's lifestyle choices are based on their nutrition needs and on their cultures, access to food, environment, friends and family, and enjoyment of certain foods or activities. A variety of factors play roles in how people select foods, plan meals, and decide where to eat and with whom. A variety of factors also influence what physical activities people engage in and how long they spend on physical activity each day.

The *Dietary Guidelines for Americans* and the *Physical Activity Guidelines for Americans* are the foundation for nutrition and physical activity principles that form the basis for government nutrition policy and education.[1,2]

DIETARY GUIDELINES FOR AMERICANS

The *Dietary Guidelines for Americans 2010* comprise core principles to help people, ages 2 years and older, develop healthy lifestyles based on individual needs, likes, and dislikes related to both eating and physical activity. The *Dietary Guidelines* focus on choosing from a variety of nutritious foods, reading food labels, and being more physically active to meet nutrition requirements, promote health, and reduce risk of chronic disease. The *Dietary Guidelines* emphasize that individuals and families can make choices today that will help them feel good and be healthy in the future.[1]

The *Dietary Guidelines* summarize and synthesize knowledge about individual nutrients and food components into an interrelated set of recommendations for healthy eating that can be adopted by the public. Taken together, the *Dietary Guidelines* recommendations encompass 2 over-arching concepts[1]:

- Maintain calorie balance over time to achieve and sustain a healthy weight.
- Focus on consuming nutrient-rich foods and beverages.

Box 1 lists the *Dietary Guidelines for Americans 2010* key recommendations, which are the most important for improving public health. To get the full benefit, individuals should carry out the *Dietary Guidelines* recommendations in their entirety as part of an overall healthy eating pattern.

The *Dietary Guidelines,* which are jointly issued by the US Department of Agriculture and the US Department of Health and Human Services, are updated every 5 years. New communication tools based on the *Dietary Guidelines* are available at http://www.health.gov/dietaryguidelines.

NUTRITION FACTS FOOD LABEL

The *Nutrition Facts* food label appears on most packaged foods. The label helps people select foods that meet *Dietary Guidelines* recommendations. Key nutrients (including the amount of nutrients per serving) that the food provides are listed on the label. The *Nutrition Facts* food label provides a mechanism for comparing the calories and nutrients in different foods. Consumers can also use the label to choose foods rich in polyunsaturated and monounsaturated fat and low in saturated fat, trans fat, and cholesterol, or to choose foods with less sugar and salt.[3] See Figure 1 on page 6 for a sample nutrition facts label.

PHYSICAL ACTIVITY GUIDELINES FOR AMERICANS

The *Physical Activity Guidelines for Americans* describe the types and amounts of physical activity that offer substantial health benefits for children and adolescents ages 6 and older and adults.[2] The *Physical Activity Guidelines for Americans* complement the *Dietary Guidelines for Americans*, and together the 2 documents provide guidance on the importance of being physically

BOX 1. *DIETARY GUIDELINES FOR AMERICANS 2010* KEY RECOMMENDATIONS

Balancing Calories to Manage Weight

Prevent and/or reduce overweight and obesity through improved eating and physical activity behaviors.

Control total calorie intake to manage body weight. For people who are overweight or obese, this will mean consuming fewer calories from foods and beverages.

Increase physical activity and reduce time spent in sedentary behaviors.

Maintain appropriate calorie balance during each stage of life—childhood, adolescence, adulthood, pregnancy and breastfeeding, and older age.

Foods and Food Components to Reduce

Reduce daily sodium intake to less than 2,300 mg and further reduce intake to 1,500 mg among persons who are 51 and older and those of any age who are African American or have hypertension, diabetes, or chronic kidney disease. The 1,500 mg recommendation applies to about half of the US population, including children and the majority of adults.

Consume less than 10% of calories from saturated fatty acids by replacing them with monounsaturated and polyunsaturated fatty acids.

Consume less than 300 mg per day of dietary cholesterol.

Keep trans fatty acid consumption as low as possible by limiting foods that contain synthetic sources of trans fats, such as partially hydrogenated oils, and by limiting other solid fats.

Reduce the intake of calories from solid fats and added sugars.

Limit the consumption of foods that contain refined grains, especially refined grain foods that contain solid fats, added sugars, and sodium.

If alcohol is consumed, it should be consumed in moderation—up to 1 drink per day for women and 2 drinks per day for men—and only by adults of legal drinking age.

Foods and Nutrients to Increase

Individuals should meet the following recommendations as part of a healthy eating pattern while staying within their calorie needs.

Increase vegetable and fruit intake.

Eat a variety of vegetables, especially dark-green and red and orange vegetables and beans and peas.

Consume at least half of all grains as whole grains. Increase whole-grain intake by replacing refined grains with whole grains.

Increase intake of fat-free or low-fat milk and milk products, such as milk, yogurt, cheese, or fortified soy beverages.

Choose a variety of protein foods, which include seafood, lean meat and poultry, eggs, beans and peas, soy products, and unsalted nuts and seeds.

Increase the amount and variety of seafood consumed by choosing seafood in place of some meat and poultry.

Replace protein foods that are higher in solid fats with choices that are lower in solid fats and calories and/or are sources of oils.

Use oils to replace solid fats where possible.

Choose foods that provide more potassium, dietary fiber, calcium, and vitamin D, which are nutrients of concern in American diets. These foods include vegetables, fruits, whole grains, and milk and milk products.

Building Healthy Eating Patterns

Select an eating pattern that meets nutrient needs over time at an appropriate calorie level.

Account for all foods and beverages consumed and assess how they fit within a total healthy eating pattern.

Follow food safety recommendations when preparing and eating foods to reduce the risk of foodborne illnesses.

Source: US Department of Agriculture, US Department of Health and Human Services.[1]

FIGURE 1. NUTRITION FACTS

Nutrition Facts

Serving Size 1 cup (228g)
Servings Per Container 2

Amount Per Serving

Calories 250	Calories from Fat 110
	% Daily Value*
Total Fat 12g	18%
Saturated Fat 3g	15%
Trans Fat 1.5g	
Cholesterol 30mg	10%
Sodium 470mg	20%
Total Carbohydrate 31g	10%
Dietary Fiber 0g	0%
Sugars 5g	
Protein 5g	
Vitamin A	4%
Vitamin C	2%
Calcium	20%
Iron	4%

* Percent Daily Values are based on a 2,000 calorie diet. Your Daily Values may be higher or lower depending on your calorie needs:

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Source: US Department of Health and Human Services, Food and Drug Administration.[3]

active and eating healthy foods to promote health and reduce the risk of chronic diseases.

Children and adolescents can achieve substantial health benefits by doing moderate- and vigorous-intensity physical activity for a total of 60 minutes or more each day. This should include aerobic activity as well as age-appropriate muscle- and bone-strengthening activities. It appears that the total amount of physical activity is more important for achieving health benefits than any one component (frequency, intensity, or duration) or the specific mix of activities (aerobic, muscle strengthening, or bone strengthening). Even so, bone-strengthening activities remain especially important for children and adolescents because the greatest gains in bone mass occur during the years just before and during puberty, and most peak bone mass is obtained by the end of adolescence.[2]

Just as children and adolescents can get in the habit of being physically active on a regular basis, they can also learn to be inactive if they are not given opportunities to be active. Children and adolescents who are inactive are much more likely to be sedentary as adults.

Children and adolescents learn by example—if parents, grandparents, and other family members enjoy and engage in physical activity on a regular basis, they will too.

BOX 2. KEY PHYSICAL GUIDELINES FOR CHILDREN AND ADOLESCENTS AGES 6 AND OLDER

- Children and adolescents should engage in 60 or more minutes of physical activity each day.
  - Aerobic: Most of the 60 or more minutes a day should be either moderate- or vigorous-intensity aerobic physical activity and should include vigorous-intensity physical activity at least 3 days a week. Moderate-intensity activities include hiking, skateboarding, rollerblading, bicycling, and brisk walking. Vigorous-intensity activities include jumping rope; running; bicycling; swimming; or playing basketball, soccer, tennis, and hockey.
  - Muscle-strengthening: As part of the 60 or more minutes of daily physical activity, children and adolescents should include muscle-strengthening physical activity at least 3 days a week. Muscle-strengthening activities can be unstructured and part of play, such as playing on playground equipment, playing tug-of-war, and climbing trees. These activities can also be structured, such as lifting weights, doing sit-ups, or working with resistance bands.
  - Bone-strengthening (weight-bearing): As part of their 60 or more minutes of daily physical activity, children should include bone-strengthening physical activity at least 3 days a week. Bone-strengthening activities include jumping rope; running; or playing basketball, soccer, volleyball, and tennis.
- It is important to encourage children and adolescents to engage in physical activities that are appropriate for their age, that are enjoyable, and that offer variety.

Source: US Department of Health and Human Services.[2]

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Nutrition in the Community

A community can be defined by its geography, its government, and the services it offers (eg, social, education, health). A community's character reflects its size, its cultural diversity, and the common interests of its residents. Communities need systems, funding, and resources to meet residents' nutrition needs.

Nutrition services are usually provided by dietitians, nutritionists, and other health professionals; however, they may also be provided by others in the community, including social service providers, teachers, child care providers, and after-school program staff. Community settings—such as child care facilities, community centers, schools, colleges and universities, and clinics and hospitals—are excellent forums in which health professionals and others can provide nutrition supervision and promote optimal nutrition.

PARTNERSHIPS FOR PROMOTING OPTIMAL NUTRITION

To promote optimal nutrition for infants, children, and adolescents, partnerships among health professionals, families, and communities are key. Partnerships can do the following:

- Assess the nutrition needs of infants, children, and adolescents.
- Identify families' health beliefs.
- Establish nutrition priorities and develop, implement, monitor, and evaluate nutrition programs and services.
- Promote healthy eating behaviors, regular physical activity, and a healthy lifestyle.

Partnerships can be as informal as health professionals discussing nutrition issues and concerns with teachers, school food service employees, coordinators of after-school programs, and child care providers. However, formal partnerships may also be needed. As communities develop strategies to achieve the goals outlined in *Healthy People 2020,* health professionals have an excellent opportunity to create these partnerships with families, community groups, government and business representatives, and others who are committed to improving the nutritional status of infants, children, and adolescents.

Children and adolescents need activities through which they can learn about food and nutrition. Community activities that include serving a variety of foods that are healthy and tasty and meet some of a child's or adolescent's nutritional needs in a pleasant environment can help communicate healthy nutrition messages. Programs that offer meals and snacks during or after school or during the summer are other important opportunities for health promotion.

NUTRITION NEEDS ASSESSMENT

One way for health professionals to assess the nutrition status of infants, children, and adolescents in the community is to gather information through a nutrition needs assessment. A nutrition needs assessment can identify the following:

- Adverse pregnancy outcomes (eg, low birth weight, infant mortality)
- Breastfeeding rates (eg, how many infants are breastfed, duration of breastfeeding)
- Growth data for infants, children, and adolescents (eg, length, height, weight)
- How many infants, children, and adolescents have iron-deficiency anemia
- How many infants, children, and adolescents are at risk for chronic diseases
- How many infants, children, and adolescents have special health care needs
- How many children and adolescents are overweight (body mass index [BMI] of 85th to 94th percentile or are overweight (BMI ≥95th percentile)

Additional information can be gathered on the number of community residents who are employed, unemployed, and underemployed, which may indicate the risk of insufficient nutrition—and consequently hunger—in the community.

A less formal way to discern the nutrition status of infants, children, and adolescents in the community is through "shoe leather" observation: walking through neighborhoods and noting the kinds of foods sold, including by "mom and pop" stores, farmers' markets, vendors, and restaurants. In addition, noting the kinds of products sold at local drug and health food stores provides invaluable insight into a community's health beliefs and nutrition practices.

Informal assessments such as these provide information not only on the types of foods consumed in the community but also on whether families have access to safe and nutritious foods at a reasonable cost. If neighborhood stores are limited in the variety of foods available, families that purchase most of their food from these stores are likely to have diets that reflect these limitations. For example, foods such as reduced-fat (2%), low-fat (1%), or fat-free (skim) milk and fresh fruits and vegetables may not be available in neighborhood stores. To buy these foods, families would need to shop elsewhere, which can involve additional transportation costs, increase the time needed to shop, and make it difficult to carry the food home.

NUTRITION SERVICES

Dietitians and nutritionists in the community work with Head Start programs, child care facilities, food and nutrition programs, and health departments and clinics that provide services to infants, children, and adolescents. Through a range of services, dietitians and nutritionists can help children, adolescents, and their families learn about healthy foods and how to store, handle, and prepare foods so that their nutrient content is retained.

Nutrition education helps parents form the foundation for their children and adolescents to practice healthy eating behaviors throughout life. Health professionals have many opportunities to educate families about nutrition. For example, they can provide education on healthy eating during pregnancy and breastfeeding, the introduction of solid foods to infants, and the importance of providing healthy foods to children and adolescents.

While emphasizing the importance of establishing lifelong healthy eating behaviors, health professionals must respect all cultures. Foods important in various cultures can be used in education efforts so that all families will feel comfortable and thus be willing to follow nutrition counseling.

Dietitians, nutritionists, and other health professionals in the community can provide leadership to ensure that healthy eating behaviors and regular physical activity are promoted by everyone committed to meeting the health needs of infants, children, and adolescents. Health professionals can also provide intervention strategies, referrals to specific health services, and follow-up after referrals are made. By communicating accurate and consistent information, health professionals can have a significant impact on the growth, development, and health and nutrition status of infants, children, and adolescents in the community.

Community nutrition services include the following components:

SCREENING AND ASSESSMENT

- Identifying the community's health problems
- Evaluating effectiveness, accessibility, and quality of personal and population-based services
- Developing nutrition diagnoses
- Developing individual nutrition plans
- Identifying other sources of nutrition and health information or guidance

ANTICIPATORY GUIDANCE

- Providing children, adolescents, and their families with information about nutrition issues and concerns
- Providing referrals to food and nutrition programs if needed
- Providing monitoring and follow-up when indicated, and making referrals to a dietitian or other health professionals if needed

EDUCATION

- Working in partnership with community stakeholders (eg, faith-based groups, ethnic/racial advocacy and support groups, community elders) to develop accurate and consumer-friendly educational materials that are developmentally, linguistically, and culturally appropriate for children, adolescents, and their families
- Preparing educational materials for point-of-purchase distribution (eg, stores, restaurants)
- Conducting in-service training for health professionals
- Conducting in-service training for school food service personnel

TECHNICAL ASSISTANCE

- Developing food service and nutrition performance standards
- Integrating nutrition into education, health, and physical education programs
- Developing health and nutrition services that are community based, family centered, and culturally sensitive

CONSULTATION

- Consulting with health professionals, educators, and personnel from social services and other community agencies (eg, housing and environmental protection agencies)

INFORMATION DISSEMINATION

- Disseminating current and accurate information to health professionals, families, and the community
- Preparing and distributing informational and educational materials to community newsletters, newspapers, radio and television stations, and other media

ADVOCACY

- Promoting community-based food and nutrition resources
- Helping families obtain access to food and nutrition resources
- Developing strategies to address nutrition issues and concerns (eg, nutritional inadequacy, hunger)
- Making health care delivery systems user-friendly and responsive to families' needs

HOW TO FIND A REGISTERED DIETITIAN OR NUTRITIONIST IN THE COMMUNITY

How can residents find a registered dietitian or nutritionist in their community? They can start by contacting local hospitals; the Special Supplemental Nutrition Program for Women, Infants and Children (WIC); Head Start and other child care programs; cooperative extension and school food programs; state, county, and city health departments; and local colleges and universities. Residents can also contact local affiliates of the American Heart Association, American Diabetes Association, American Dietetic Association, American Cancer Society, and March of Dimes. (See Tool J: Nutrition Resources.)

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Cultural Awareness in Nutrition Services

All people belong to a cultural group. Culture influences the way people look at things, how they interact with others, and how they expect others to behave. Health professionals need to understand how their own cultures influence their attitudes and behaviors, and they need to understand some aspects of the cultures of the people they serve and the implications of culture for nutrition counseling.

To meet the challenge of providing nutrition supervision to people from diverse cultural backgrounds, health professionals can observe people and their traditions, including the foods they eat and the occasions they celebrate. Such observations can enhance the health professional's awareness and knowledge of other cultures.

CULTURE AND FOOD

Food choices, which can be very personal, are influenced by culture. For many people, culture-specific foods are closely linked to their families and strong feelings of being cared for and nurtured. However, when discussing their food choices, people may respond by saying what they think the health professional wants to hear. Health professionals can encourage people to be more candid by asking open-ended, nonjudgmental questions.

The roles of certain foods vary among cultures, but in most cultures, food is used for similar purposes. For example, in all cultures, staple or core foods form the foundation of the diet. A staple food—such as rice or beans—is typically bland, relatively inexpensive, easy to prepare, an important source of calories, and an indispensable part of the diet. In addition, people from virtually all cultures use food during celebrations, and many use food as medicine or to promote health.

Culture also influences how people prepare food, how they use seasonings, and how often they eat certain foods. These behaviors can differ from region to region and from family to family.

Acculturation—the adoption of the beliefs, values, attitudes, and behaviors of a dominant or mainstream culture—also influences a person's food choices. Acculturation may involve altering traditional eating behaviors to make them similar to those of the dominant culture. These changes can be grouped into 3 categories: (1) the addition of new foods, (2) the substitution of foods, and (3) the rejection of foods. People add new foods to their diets for several reasons, including increased economic status and food availability (especially if the food is not readily available in the person's homeland). Substitution may

occur because new foods are more convenient to prepare, more affordable, or better liked than traditional ones. People, particularly children and adolescents, may reject eating traditional foods because it makes them feel different.

KEYS TO GOOD CROSS-CULTURAL COMMUNICATION

Good communication during nutrition supervision is important for providing anticipatory guidance. To keep the lines of communication open, health professionals must overcome any real or perceived differences between them and the people they serve. Being open, honest, respectful, nonjudgmental and, most important, willing to listen and learn is critical. Health professionals can help people in a way that maintains each individual's dignity. Some keys to good cross-cultural communication follow.[1]

- *Respect personal space.* Health professionals can make people feel comfortable by asking them to sit where they want. This allows people to have the personal space they need.
- *Learn and follow cultural rules about touching.* It is essential for health professionals to learn these rules, including rules based on a person's sex. For example, in some Asian cultures, a person's head should not be touched because the head is considered the "seat of wisdom." In some American Indian cultures, a vigorous handshake may be considered a sign of aggression.
- *Establish rapport.* Health professionals can establish rapport with people by sharing experiences, exchanging information, and greeting and responding to them in culturally appropriate ways.
- *Express interest in people.* Health professionals can express interest in various ways: by smiling, being friendly and warm, asking questions (even about things they are unfamiliar or uncomfortable with), showing respect, and demonstrating that they are open-minded and trustworthy. Paying attention to children may impress mothers from particular cultures. However, health professionals need to be aware that people from some cultures believe that it is inappropriate to accept compliments about their children, especially if the children are present.
- *Listen carefully.* Health professionals must listen carefully and not interrupt people or try to put words in their mouths.
- *Respect silence.* Health professionals do not have to fill a silent moment with small talk. People need a chance to gather their thoughts, especially when they are trying to speak in a language in which they are not fluent.
- *Notice how people make eye contact.* Health professionals need to observe how people make eye contact with family members and others. Many cultures consider it impolite to look directly at the person who is speaking. Lowering the eyes and glancing sideways may be seen as respectful, especially if the speaker is older or in a position of authority.
- *Pay attention to body language.* Health professionals must learn what messages are conveyed by body movements, such as turning up the palms of the hands, waving, and pointing, and which gestures should be avoided.
- *Reach the appropriate family member.* In some cultures the oldest male is considered the head of the family, while in others an elderly female has this role. Health professionals must try to ensure that their messages reach the head of the family.
- *Study a person's responses.* A "yes" response does not necessarily indicate that a person understands the message or is willing to do what is being discussed. The person may simply be showing respect for the health professional. For example, American Indians may be hesitant about asking questions because they believe that doing so indicates that the health professional is not communicating clearly. People may smile or laugh to mask emotions or prevent conflict. Health professionals can make sure that a person understands by asking questions.
- *Communicate effectively.* Convey information in a manner that is easily understood by diverse audiences, including individuals with limited English proficiency, individuals with limited literacy skills, and individuals with disabilities.[2]

COMMON NUTRITION CONCERNS AMONG CULTURALLY DIVERSE POPULATIONS

FOOD AND HEALTH BELIEFS

In many cultures, people believe that food promotes health, cures disease, or has other medicinal qualities. In addition, many people believe that maintaining balance is important to health. For example, traditional Chinese people maintain that health and disease are related to the balance between the yin and yang forces in the body. Diseases caused by yin forces are treated with yang foods to restore balance, and vice versa. In Puerto Rico, foods are classified as hot or cold (which may not reflect the temperature or spiciness of foods), and people believe that maintaining a balance between these 2 types of foods is important to health. Health professionals can become more effective by exploring such beliefs and incorporating them in their nutrition messages.

LACTOSE INTOLERANCE

Lactose intolerance is much more common in people of non-European ancestry than among those of European ancestry. People who are lactose intolerant may experience cramps and diarrhea when they eat moderate to large amounts of foods that contain lactose, such as milk and other dairy products. Children and adolescents may be able to avoid symptoms by consuming small servings of milk throughout the day or by consuming lactose-reduced milk or lactase tablets or drops with milk. Cheese and yogurt are often better tolerated than milk because they contain less lactose. For people who cannot tolerate any milk or dairy products in their diet, health professionals can suggest other sources of calcium, such as dark green, leafy vegetables; tofu or corn tortillas processed with calcium; and calcium-fortified orange juice.

CULTURALLY BASED ATTITUDES

People from different cultures may view body weight differently. Keeping a child from being underweight may be very important to people from cultures in which poverty or insufficient food supplies are common. Families may not recognize that their child is overweight according to body mass index tables. They may view excess weight as healthy and might be offended if a health professional refers to their child as overweight. (See the Obesity chapter.)

SUMMARY

To meet the challenge of providing nutrition supervision to diverse populations, health professionals must learn to respect and appreciate the variety of cultural traditions related to food and the wide variation in food practices within and among cultural groups. Health professionals can take advantage of interactions with people from other cultures by sharing food experiences, asking questions, observing the food choices people make, and working with the community.

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Nutrition Issues and Concerns

Breastfeeding

Health professionals are uniquely positioned to influence women in their decision about whether to breastfeed. Discussing the benefits of breastfeeding during prenatal care enables parents to make an informed choice about whether and for how long to breastfeed their infant. Breastfeeding success is in large part dependent on a health professional's supportive attitudes, a hospital climate that is conducive to the initiation and maintenance of breastfeeding, family support, and health professionals' awareness of the need for breastfeeding instruction and support.

BREASTFEEDING RATES

The *Healthy People 2010* objectives for breastfeeding are that 75% of mothers will breastfeed in the early postpartum period, and 50% will still be breastfeeding when their infant is 6 months old.[1] In 2004, 73% of mothers breastfed their infants in the early postpartum period, and 41% continued to breastfeed through age 6 months.[2] The *Healthy People 2010 Midcourse Review* objectives for breastfeeding are that 60% of mothers will breastfeed exclusively for 3 months, and at least 25% will breastfeed exclusively for 6 months.[3] In 2004, 30% of mothers exclusively breastfed their infants for 3 months, and 11% exclusively breastfed their infants for 6 months.[2] To promote optimal nutritional status for infants, it is essential that health professionals and parents recognize the enormous benefits of breastfeeding and breast milk, understand how to effectively manage lactation, and learn the importance of breastfeeding exclusively during the first 6 months of life.

Most infants born in the United States in the 20th century were not breastfed. Cow's milk preparations and other infant formulas were usually the major source of nutrition during the first year of life. However, research conducted over the past 30 years has repeatedly demonstrated the importance of breast milk for infants.[4] This recognition of the health, nutritional, immunologic, psychological, and societal advantages of breast milk over all substitutes has led to a gradual increase in breastfeeding, especially during the first 2 to 4 months of life. Additional health benefits from breastfeeding for mothers—as well as economic and environmental advantages—have been identified.[4–8]

BREASTFEEDING BENEFITS

Breastfeeding provides infants with significant protection against a variety of infectious diseases, particularly in areas with poor sanitation and contaminated water and food supplies. Epidemiological studies have shown that, compared with formula-fed infants, breastfed infants may have fewer and less severe bacterial and viral diseases, including meningitis, gastroenteritis, otitis media, pneumonia, botulism, and urinary tract infections.[4–6]

Epidemiological data suggest that children who were breastfed as infants experience certain chronic disorders at a lower rate than their counterparts who were not breastfed. Breastfeeding may confer a protective effect against some chronic disorders, such as Crohn's disease,[9] celiac disease,[10] lymphoma and leukemia,[11–13] type 1 diabetes mellitus,[14] and certain allergic conditions.[15] Some of the preventive effects of breastfeeding (including the preventive effects against otitis media and asthma) continue well beyond the period of breastfeeding, suggesting that breastfeeding enhances long-term immunologic response.[4] Moreover, growth patterns observed in the first year of life suggest that breastfeeding may help prevent obesity.[5] Multiple studies have demonstrated an association between breastfeeding and improved cognitive behavior, including higher IQs and improved school performance through adolescence.[7]

In the days after delivery, the mother's lactation reduces postpartum bleeding and the size of the uterus (an effect of oxytocin). The absence of menstruation during lactation reduces iron loss and delays the resumption of ovulation.[16] Consequently, the time between pregnancies is increased, the risk of prematurity in later pregnancies is reduced, and adverse outcomes for the pregnancy or the infant are reduced. In proportion to the total duration of lactation, women who breastfeed have lower rates of ovarian cancer, premenopausal breast cancer, hip fractures, and osteoporosis.[5,6]

Hospitalizations, medical office visits, and pharmaceutical use are significantly reduced for breastfed infants, cutting health care costs by an average of $200 per breastfed infant compared with formula-fed infants.[8] Improved infant health reduces loss of income due to parents' absence from work to care for the infant. Breastfeeding also eliminates or reduces the need to purchase infant formula, the cost of which has been estimated to range from $750 to $1,500 for the first year of life. Breast pump rental or purchase and lactation consultation services may counteract some of these savings, but the net economic benefit remains significant.[16]

BREAST MILK COMPOSITION

Human milk is radically different from cow's milk and even from prepared infant formula, despite attempts to modify formulas to make them similar to breast milk. Breast milk is low in protein (about 0.9 g/100 mL) compared with raw cow's milk, which has nearly 4 times the concentration of protein.[16] Infant formulas are diluted to provide a low protein concentration that is similar to the concentration in human milk, but the protein structure (which is more difficult for the young infant to absorb) remains the same as that of cow's milk. In some formulas, the ratio of whey to casein is altered in an attempt to mimic the amino acid concentrations in breast milk, in which whey is dominant. Human milk proteins contain antibodies (known as secretory IgA) that are structured specifically to resist digestion.

Breast milk also contains hundreds of micronutrients, including free amino acids, essential fatty acids, minerals, growth factors, cytokines, and other chemical agents that contribute to infant growth and development. Many of these components serve as both nutrients and bioactive agents to enhance the infant's development.

Breast milk's composition varies during the course of breastfeeding. Colostrum, the initial milk, is higher in protein and lower in fat and lactose concentrations than mature milk.[16] Throughout the course of lactation, secretory IgA concentration gradually declines, allowing the infant's immune system to develop and lose its dependency on the mother's sources. Because the mother and infant share the same environment, the mother develops and secretes antibodies specific to the viruses and bacteria to which the infant is exposed. This response is rapid, requiring only a few days. These dynamic changes in the composition of breast milk show how well it adapts to meet the infant's needs.

INITIATING BREASTFEEDING

Breastfeeding is established most successfully when it is begun during the first hour after birth. The infant and mother should remain together throughout the recovery and postpartum period, with no interruptions in the rooming-in. The mother should be encouraged to put her infant to the breast at the earliest signs of hunger (eg,

mouthing motions, hand-to-mouth movements, wide-eyed eagerness, cooing).[16] Crying is a late sign of hunger that often interferes with good breastfeeding; the crying infant usually requires calming before breastfeeding can begin. Positioning and latching-on require some initial experimentation. A good let-down or milk-ejection reflex (tingling sensation and a strong surge of milk) in the breast, accompanied by brief cramping pain in the uterus (from the release of oxytocin by the pituitary gland), are signs of a good latch-on in the first few days' postpartum. Although only small amounts of colostrum are produced at each feeding for the first day or so, this initial milk is vital for nutrition and immune protection. No supplemental feeding is necessary in most cases, and families should be counseled that weight loss in the first few days of life is expected and normal. The volume of breast milk will increase over the next few days. Counseling by a lactation consultant can often identify problems in positioning and latching-on that can be easily corrected before unnecessary pain and nipple injury occur.[17]

Mothers should breastfeed at least 8 to 12 times every 24 hours during the early weeks of lactation, and the infant should empty the first breast before being put to the second breast. Frequent breastfeeding and complete emptying of both breasts will help prevent engorgement and stimulate breast milk production. The hind milk—the portion that comes out toward the end of emptying a breast—contains much more fat, which provides essential calories and signals the infant to end feeding on that breast.[16] Water and formula supplementation are not needed and should be discouraged, because they may interfere with the development of good breastfeeding patterns. Water supplementation also increases the likelihood that the infant will consume fewer calories and subsequently develop jaundice and severe hyperbilirubinemia. When the infant does not get sufficient calories and produce enough stools, bilirubin is not excreted, and the infant can become jaundiced. The use of pacifiers should also be discouraged during the early weeks of life, until breastfeeding is well established, as pacifier use may complicate breastfeeding initiation and cause premature weaning.[5]

The mother and health professionals can evaluate the adequacy of the infant's milk intake by observing whether the infant has 5 or more wet diapers and 3 or 4 stools per day by age 5 to 7 days. A trained observer should evaluate the breastfeeding position, latch-on, and sucking and swallowing during the first few days. Within 3 to 5 days after birth and within 48 to 72 hours after discharge from the hospital, the mother and infant should be seen by a physician or other health professional trained in lactation management to evaluate breastfeeding.[17] If the infant is being monitored for hyperbilirubinemia, follow-up may occur even sooner, within 24 to 72 hours of discharge. At this time, infants should be weighed; if they have lost more than 7% of their birth weight, the mother's breastfeeding practices should be evaluated and, if necessary, corrected to increase milk production and frequency and duration of feeding. Nipple pain and cracking, breast engorgement, and all other problems should also be addressed to ensure that breastfeeding is successful. If problems are not evaluated and corrected at this point, breastfeeding may be stopped too early.[17]

Mothers should be able to obtain counseling from a lactation consultant by phone and in person when needed. Home or office visits with licensed, certified lactation consultants, nurses, nutritionists, or physicians trained in breastfeeding can be helpful in evaluating and correcting breastfeeding problems. Peer support groups (eg, La Leche League International) are also helpful throughout infancy, especially when the mother is initiating breastfeeding and adapting to her new infant. If the mother has breastfeeding issues or concerns, she should contact her infant's pediatrician.

THE MOTHER'S DIET

During the early weeks of breastfeeding, the mother does not need to eat more food than she would have eaten before pregnancy. Fat stores provide adequate energy sources for milk production. Encourage the mother to drink extra fluids (especially milk, juice, and water) to keep from getting thirsty. Breastfeeding accelerates the mother's return to her pre-pregnancy weight. However, after about 6 weeks, breastfeeding mothers need to eat more to satisfy their energy needs. Increasing calories by 400 or less per day

and drinking enough water to satisfy thirst is usually sufficient.[18] A well-balanced diet is adequate, and no special foods or nutrient groups are required.

While most foods (including spicy and exotic ones) eaten by the mother are well tolerated by breastfeeding infants, occasionally the infant may have symptoms that suggest allergy or intolerance. For example, cow's milk protein enters breast milk and has been shown to result in sensitization and allergic symptoms in about 8% of breastfed infants. In these cases, the mother may need to eliminate known or suspected allergenic foods (especially dairy products) from her diet. The mother's caffeine intake should be eliminated or reduced, because caffeine in breast milk may lead to prolonged waking periods or agitation in the infant. Alcohol intake during lactation should be an occasional single drink, because alcohol is readily transferred to breast milk. The Institute of Medicine reports that 8 oz wine, 12 oz beer, or 2 oz hard liquor is safe if breastfeeding is then delayed for 2 hours.[19] Breastfeeding mothers should be discouraged from smoking, especially while breastfeeding.

CONTINUING BREASTFEEDING

For healthy, full-term infants, breast milk from a well-nourished mother offers enough vitamins and minerals, with the exception of vitamin D and possibly iron, during the first 6 months. Because maternal stores of vitamin D are low, it is recommended that all breastfed infants receive 400 IU of vitamin D per day beginning shortly after birth and continuing throughout breastfeeding[20] and an iron supplement (1 mg/kg/day) beginning at age 4 months.[5] Ideally, mothers should exclusively breastfeed for a minimum of 4, but preferably 6, months.

Healthy infants usually require little or no supplemental water. Water is not needed during the first 6 months and should be offered thereafter only when the infant has lost an excessive amount of water. Breastfeeding can continue for 12 months or as long as the mother and infant wish.[5] The benefits of breastfeeding for both the mother and the infant or child continue for as long as breastfeeding is practiced.

Some mothers may wish to breastfeed and formula-feed their infants, perhaps because they have returned to work or school outside the home. Mixed feeding should be discouraged during the early weeks of breastfeeding because it often interferes with the establishment of a good breast milk supply and may lead to premature weaning from the breast.[17] Some mothers may be able to adapt their breastfeeding schedules after a few months so that they can go without feeding or pumping for 6 to 8 hours during the day and then breastfeed the infant frequently in the evening and at night.

For mothers returning to work or school, breastfeeding can be effectively maintained by pumping and storing the expressed breast milk in a cooled container (eg, an insulated bag with ice packs, in a prefrozen insulated vacuum bottle) for 24 hours. Breast milk can be stored in the refrigerator for 5 days, in the freezer compartment of a refrigerator for 2 weeks, in a freezer compartment of the refrigerator with separate doors for 3–6 months, and in a chest or upright deep freezer for 6 to 12 months.[21] Breast milk should never be stored in the door of a freezer because of the freezing-thawing effect of continually opening and closing the door. Similarly, milk stored in the refrigerator should not be stored in the door because of the cooling-warming effect. Sterile or well-cleaned hard plastic or glass containers are suitable for storing breast milk. Frozen breast milk should be thawed slowly either at room temperature, in the refrigerator, or in a warm-water bath. Breast milk should never be warmed in a microwave oven since it can easily overheat or may heat unevenly (because of hotspots caused by microwaving), burning the infant and destroying the milk's beneficial qualities.

Mothers who plan to go back to work or school should talk with their employer or with school personnel about the need for a private place to pump and about ensuring that they have time to pump. Some employers purchase high-grade electric breast pumps for employees' use and allow sufficient time to use them. These arrangements benefit an organization financially because employees' absences to care for sick infants, as well as health insurance costs, may be reduced, and employee satisfaction (and thereby retention)

improves.[22–24] However, women who have hourly jobs in non-office or retail settings may find it more challenging to make these arrangements.

Weaning should occur naturally and gradually when the mother and infant are ready, although preferably not before the infant's first birthday.[5,17] The most comfortable way to wean is for mothers to gradually reduce the frequency of breastfeeding and replace breast milk with other foods over a period of several weeks. In the first year, only iron-fortified infant formula is appropriate as a substitute for breast milk.[5]

Complementary (solid) foods can be introduced between ages 4 and 6 months when the infant is developmentally ready. After age 6 months, solid foods aid in the development of appropriate feeding and eating skills for all infants and provide additional nutrients to meet the Dietary Reference Intakes for breastfed infants. Instruct parents to offer good sources of iron, such as iron-fortified, single-grain infant cereals (eg, rice cereal) and pureed meats, especially red meats, as the first solid food. They provide ample sources of iron, zinc, and protein, nutrients especially needed by breastfed infants.[25,26] One ounce (30 g) of infant cereal provides the daily iron requirement, particularly if fed with vitamin C–rich foods, such as baby fruits, which enhances iron absorption from the cereal.

CONTRAINDICATIONS TO BREASTFEEDING

While breast milk is the best food for almost every infant, breastfeeding and breast milk in some cases may be contraindicated, either temporarily or permanently.[5,6]

The strongest contraindication is when the infant has an inherited metabolic disorder, such as galactosemia, in which he is unable to metabolize the lactose portion of milk sugar, called galactose. Lactose elimination for the infant must then be implemented, and the infant should not be breastfed. Infants with phenylketonuria may continue to receive breast milk (because of its low phenylalanine concentration) if they are monitored carefully for blood phenylalanine levels. There are other inherited disorders that contraindicate or require modification of breastfeeding, but they are rare.

Although HIV and untreated active pulmonary tuberculosis are contraindications to breastfeeding in the United States, most maternal infections do not contraindicate breastfeeding.[5,6] Maternal hepatitis A, B, and C are usually not transmitted through breastfeeding. The infant must be immunized against hepatitis B. Cytomegalovirus through breastfeeding may be a risk to premature infants, but it is not a risk to full-term infants. A mother who develops a fever or other signs of a mild, non–life-threatening infection while breastfeeding (whether from a viral or a bacterial infection) has already exposed her infant to the infection and should be encouraged to continue breastfeeding the infant or to express breast milk; the breast milk will provide specific antibodies and other nonspecific anti-infectious agents to protect the infant. In fact, discontinuing breastfeeding may increase the infant's risk of developing the infection. Mastitis does not harm the infant, and the continuation of breastfeeding is essential to hasten the mother's recovery. Breastfeeding may even be continued with breast abscesses, as long as the incision and surgical drainage tube are far enough away from the areola that they are not involved in feeding.

Breastfeeding mothers can take most drugs, whether prescription or over the counter. Radioactive isotopes, certain antimetabolites (eg, chemotherapeutic agents), and a few antibiotics and antipsychotic drugs are contraindicated during breastfeeding. Every effort should be made to substitute safe drugs or maintain lactation by pumping while the drugs are being administered. Excellent references are available to identify which drugs are safe and which are not.[1,27–29] Oral contraceptives of low-dose progesterone are safe and compatible with breastfeeding, but estrogen-containing agents should be avoided because they may inhibit milk production. Herbals are not recommended because they contain many active ingredients and are not controlled or regulated. Health professionals should include a discussion of all medication or herbal use with breastfeeding mothers as part of routine follow-up.

SUMMARY

Breast milk is a valuable, readily available resource with extensive short- and long-term benefits for both mothers and infants. It is essential that health professionals understand the benefits and management of breastfeeding and that this topic be included in their education and training. Health professionals can thus help ensure the improved health and development of almost all infants, children, and adolescents.

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Supporting an Adolescent Mother's Decision to Breastfeed

Denise Booker, a 17-year-old high school junior who is unmarried and pregnant, can't decide how to feed her baby. She is enrolled in WIC (Special Supplemental Nutrition Program for Women, Infants and Children) and has attended prenatal classes. All the health professionals have emphasized the benefits of breastfeeding, pointing out the complete nutrient content of breast milk, the lower risk of infection for babies, and the convenience of not having to sterilize bottles and prepare infant formula. Denise has also learned that she could complete her senior year at a high school that provides child care and would allow her to breastfeed her baby during school hours. She has become convinced that breastfeeding offers many advantages to her and her baby.

Denise's mother and the baby's father are trying to discourage Denise from breastfeeding. Both believe that breastfeeding will interfere with their ability to care for the baby. Denise's mother bottle-fed all of her children, and she thinks it is unnecessary to have to pump breast milk when infant formula is widely available. She has also expressed uneasiness about handling expressed breast milk when she is caring for her grandchild.

After the baby is born, a lactation consultant visits Denise in the hospital.

Denise discusses her dilemma with the WIC nutritionist, Mariana Rivera. They set up a meeting at which Denise, her boyfriend, and her mother talk openly about the issue of breastfeeding versus bottle-feeding. The nutritionist plays a videotape that demonstrates the techniques for breastfeeding and for feeding expressed breast milk. After a thorough discussion, they all agree to support Denise's desire to breastfeed her baby.

After the baby is born, a lactation consultant visits Denise in the hospital. She helps Denise position the baby for breastfeeding and explains the baby's natural reflex to search for the nipple and begin suckling. The consultant shows Denise how to tell if the baby is properly latched on to the breast and swallowing milk. Before Denise and her baby leave the hospital, the lactation consultant gives Denise some pamphlets and other educational materials on breastfeeding as well as a list of local resources. The consultant tells Denise that she will call in a few days to find out how things are going and to answer any questions. Denise is also scheduled to bring the baby into the clinic when the baby is between 3 and 5 days old so that the baby can be weighed and evaluated.

Children and Adolescents With Special Health Care Needs

The Maternal and Child Health Bureau has defined children and adolescents with special health care needs as those "who have or are at increased risk for chronic physical, developmental, behavioral, or emotional conditions and who require health and related services of a type or amount beyond that required by children generally."[1]

SIGNIFICANCE

According to the National Survey of Children with Special Health Care Needs, approximately 13.9% of children and adolescents in the United States have a special health care need.[2] These children and adolescents are at increased risk for nutrition-related health problems because of (1) physical disabilities that may affect their ability to consume, digest, or absorb nutrients; (2) biochemical imbalances caused by long-term medications or metabolic disturbances; (3) psychological stress from a chronic condition or physical disorder that may affect appetite and food intake; and/or (4) environmental factors, often controlled by parents or caregivers, which may influence access to and acceptance of food.

Young children with special health care needs have been found to be particularly vulnerable to nutrition problems. A screening project of infants and young children with developmental delays in the Massachusetts Early Head Start Program found that 92% of the infants and children had at least one nutrition risk factor, and 67% met more than one of the criteria for referral to nutrition services.[3] Nutrition reports of children with special health care needs estimate that 40% to 50% have nutrition risk factors that warrant a referral to a registered dietitian.[4,5]

Common nutrition problems in children and adolescents with special health care needs include the following[5,6]:

- Altered energy and nutrient needs
- Delayed growth
- Oral-motor dysfunction; feeding, swallowing, or digestive disorders

- Regurgitation and gastroesophageal reflux disease
- Elimination problems
- Drug/nutrient interactions
- Appetite disturbances
- Unusual food habits (eg, pica, restrictive food choices, rumination)
- Early childhood caries, gum disease

SCREENING

As with any type of health or medical concern, early identification and treatment are important to correct, control, or prevent additional harm from a nutrition problem. Table 1 outlines basic nutrition screening parameters and criteria for referral for children and adolescents with special health care needs.

TABLE 1. NUTRITION SCREENING PARAMETERS AND CRITERIA FOR REFERRAL FOR CHILDREN AND ADOLESCENTS WITH SPECIAL HEALTH CARE NEEDS[a]

Screening Data	Criteria for Referral to a Registered Dietitian
Anthropometric[b]	
Birth weight (for infants and children <18 months) Weight/[length or height]	Birth weight ≤1,500 g Weight/[length or height] ≤5th percentile Weight/[length or height] ≥95th percentile
Height/length	Inappropriate growth or weight change [Length or height]/age ≤5th percentile
Body mass index (BMI) (age >2)	BMI <5th percentile, or >85th percentile
Biochemical[c]	
Hemoglobin Hematocrit	Hemoglobin ≤11 gm/dL Hematocrit ≤34%
Clinical/Medical	
Medical condition known to affect nutrition (eg, vomiting, reflux), elimination problems, medications, and appetite or dental problems	Diagnosis of heart disease, cancer, diabetes mellitus, HIV/AIDS, cerebral palsy, inborn error of metabolism, cleft lip and palate, malabsorption syndrome, cystic fibrosis, renal disease, spina bifida, and other conditions Recurring vomiting or reflux, chronic diarrhea or constipation, severe dental caries, early childhood caries (baby bottle tooth decay), long-term use of medications that could affect nutrition, megavitamin use, or prolonged decrease in appetite with weight loss or growth failure
Diet/Feeding	
Feeding method (eg, mouth, tube, parenteral) Therapeutic diet Feeding delays or problems Significant food aversions or allergies	Tube feeding or parenteral nutrition Therapeutic diet Inability to self-feed by age 2 Limited diet because of food aversions, allergies, or socioeconomic constraints
Other	
Parental or professional concern	Unresolved concerns regarding diet, nutrition, or growth

[a]Sources: Lucas et al[5]; Campbell and Kelsey[7]; Baer and Harris[8]; and Nardella et al.[9]
[b]Growth data should be recorded and plotted on a standard growth chart. Growth charts are also available for specific conditions. Specialized growth charts have some limitations and should be use in addition to Centers for Disease Control and Prevention growth charts.
[c]Set lab levels according to your program standards.

NUTRITIONAL ADEQUACY

The energy and nutrient requirements of children and adolescents with special health care needs vary according to their individual metabolic rate, activity level, and medical status. Specific energy calculations for certain metabolic conditions have been reported in the scientific literature. Some of these energy calculations, which may be used as guidelines, are listed in Table 2. Once a desired energy level has been established and achieved, the child or adolescent should be routinely monitored to (1) ensure adequate nutrition for growth, development, and health and (2) make adjustments for periods of stress and illness.

ANTICIPATORY GUIDANCE

The goal of nutrition counseling for children and adolescents with special health care needs is to enable them to achieve optimal nutrition to support growth, development, health, and the highest possible level of functioning. Because of the complex nature of childhood neurodevelopmental and related disabilities, an interdisciplinary team approach to counseling and services is frequently needed to address multifaceted nutrition and feeding problems.[5,9] In addition to registered dietitians, other health professionals (eg, primary care practitioners; physicians; physician assistants; nurses and nurse practitioners; dentists;

TABLE 2. SELECTED ENERGY CALCULATIONS FOR CHILDREN AND ADOLESCENTS WITH SPECIAL HEALTH CARE NEEDS, BY DIAGNOSIS[a]

Medical Diagnosis	Energy Calculation
Down syndrome[10]	For children with Down syndrome, ages 5–11 Girls: 14.3 kcal/cm (36.3 kcal/inch) Boys: 16.1 kcal/cm (40.9 kcal/inch)
Spina bifida[11–13]	For children with spina bifida >6 years: As a general recommendation, provide approximately 50% of the Dietary Reference Intake (DRI) for a child of the same age To maintain weight: 9 kcal/cm (22.9 kcal/inch) To promote weight loss: 7 kcal/cm (17.8 kcal/inch)
Prader-Willi syndrome[14]	For children and adolescents with Prader-Willi syndrome To maintain growth within a growth channel: 10–11 kcal/cm To create a slow rate of weight loss and support linear growth: 8.5 kcal/cm
Cystic fibrosis[15]	For children and adolescents with cystic fibrosis and pulmonary involvement To improve weight status, increase intake from 1.1 to 2.0 times the energy needs for healthy peers of the same age, gender, and size. Monitor for age-appropriate weight gain and adjust accordingly. Oral and enteral nutritional supplements may be required.
Pediatric HIV infection or AIDS[16,17]	For children and adolescents with HIV infection Monitor closely for growth, caloric intake, and clinical symptoms. Adjust energy requirements accordingly. For children and adolescents with mild or no symptoms related to HIV infection, adjust calories to 1.5 to 2 times the DRI if growth velocity is inappropriate for age. For children and adolescents with moderate or severe symptoms, increase calories beyond those required for children and adolescents with mild or no symptoms, particularly in response to weight loss, wasting, or fever.

[a]Sources: Culley et al,[10] Ekvall and Cerniglia,[11] Grogan and Ekvall,[12] Dustrude and Prince,[13] Pipes and Powell,[14] Stallings et al,[15] Rothpletz-Puglia,[16] and Ayoob.[17]

psychologists; social workers; occupational, physical, and speech therapists) may contribute to the child's or adolescent's nutrition plan and to the family's nutrition education.

Beyond general pediatric nutrition, the following additional topics should be discussed during nutrition assessments and counseling sessions for families of children and adolescents with special health care needs:

- *Effect of certain conditions on growth parameters.* Appropriate measuring equipment (eg, wheelchair or chair scales, length boards) or alternative measurements (eg, arm span or segmental measurements, arm circumference, skinfold) should be used to accommodate children and adolescents who cannot stand independently or cannot be evaluated with traditional assessment tools. Growth charts for specific conditions and illnesses may be used as an additional reference for assessing growth. (See the list of disorder-specific growth charts at the end of the chapter.)
- *Physical activity and dietary intake.* Certain children and adolescents with special health care needs may have physical limitations that decrease their mobility and increase their risk of obesity. Others may have increased muscle tone or involuntary movements that increase their energy expenditure and therefore increase their caloric requirements.
- *Feeding problems.* Children and adolescents with special health care needs may have developmental delays, structural abnormalities, or neuromuscular problems that affect their eating skills and behaviors. Some may need feeding evaluations and swallowing studies to determine the safest and most efficient method of feeding, some may require special eating equipment or modified textures, and others may need tube feedings to supplement or replace oral feedings.
- *Enteral nutrition.* Those children who require tube feedings and receive a large part of their nutrition in the form of formula deserve special consideration for nutrition support and feeding tolerance. Attention should be given to the characteristics of the formula (eg, calories, nutrient and fiber content, osmolarity, etc), as well as the route of delivery (eg, gastric vs jejunal placement, bolus vs continuous drip, etc)
- *Hydration.* Children and adolescents with certain swallowing and feeding difficulties may have problems consuming adequate fluids to keep them well hydrated. Drooling, vomiting, or diarrhea will cause additional fluid loss. A feeding evaluation or swallowing study may be helpful to determine if a child can safely ingest fluids, correct positioning for swallowing, or the need for tube feedings. Some children may need assistance with special cups, thickened liquids, positioning, or supplemental fluids to ensure adequate hydration. A review of the child's or adolescent's fluid intake should be a part of each dietary assessment.
- *Elimination patterns.* Some children and adolescents with special health care needs have chronic elimination problems requiring medical attention. A number of factors can influence bowel function: diet, hydration, activity level, muscle tone, intestinal dysmotility, recent illness/health status, and use of medications. These elements should be explored when evaluating chronic constipation or diarrhea.
- *Medications and vitamin/mineral supplements.* Many children and adolescents with special health care needs take medications that may alter their appetite, food/fluid intake, digestion, absorption, and elimination patterns. It is important to review each medication and to educate parents about drug/nutrient interactions or side effects that may affect nutrition. In addition, vitamin and mineral supplements should be reviewed for nutritional adequacy, safety, and need. Care should be taken to prevent unnecessary vitamin/mineral use and megadoses of certain nutrients.
- *Nutrition assistance programs and community supports (as needed).* Children and adolescents with special health care needs may require many kinds of services and incur significant medical expenses. To effectively provide family-centered care, nutrition services should be available to families in their communities and should be coordinated with other medical appointments. Before prescribing dietary supplements or formulas for an infant, child, or adolescent, the health professional should make sure that the family has the necessary resources or can get assistance for obtaining these products. Resources for food assistance, special feeding equipment, and supplies

for tube feedings or parenteral feedings will vary from state to state. Selected resources include the following: Title V Maternal and Child Health program and Children with Special Health Care Needs program; Special Supplemental Nutrition Program for Women, Infants and Children (WIC); medical assistance/Medicaid; Special Nutrition Assistance Program (SNAP); and private insurance. (See Tool J: Nutrition Resources.)

REFERRAL

Children and adolescents with special health care needs who have nutrition problems should be referred to a registered dietitian in their community, preferably to one who has experience in pediatric nutrition and disabilities. Pediatric registered dietitians may be found in University Centers for Excellence in Developmental Disabilities (formerly called university affiliated programs), Title V–funded pediatric specialty clinics, pediatric and outpatient departments of local hospitals, child development clinics, WIC clinics, private practice, or the Pediatric Nutrition and the Public Health/Community Nutrition Practice Groups of the American Dietetic Association. Two community-based services for families of children with special health care needs are highlighted below.

EARLY INTERVENTION PROGRAMS

Infants and children with special health care needs who are enrolled in early intervention programs in their communities should have access to registered dietitians, occupational therapists, physical therapists, and speech and language pathologists with expertise in pediatrics who can address nutrition and feeding issues. Early intervention services provide community-based interdisciplinary evaluations and therapy services for infants and children with developmental delays. These programs were established through Part C of the Individuals with Disabilities Education Act, which lists registered dietitians and nutritionists as personnel qualified to provide early intervention services. Nutrition outcomes and objectives should be incorporated into the Individualized Family Service Plan for children with feeding and nutrition issues.[18]

SCHOOLS

The school system is an excellent community resource for families of children and adolescents with special health care needs. Through the National School Lunch Program and the National School Breakfast Program, children and adolescents may receive modified meals at school. Child and adult care food programs must provide meals at no extra cost for children and adolescents with special health care needs. Food substitutions and special meals to accommodate medical or special dietary needs are to be provided for children and adolescents identified by the educational system as having a disability. To receive these meal modifications, children and adolescents in special education programs must have a diet prescription on file from a licensed physician. The prescription must identify the disability and its effect on the child's or adolescent's diet and must state the required dietary changes and suggested meal modifications.[18,19]

To receive modified meals, children and adolescents with special health care needs who are not receiving special education services must have a written order from a recognized medical authority (eg, physician, physician assistant, nurse practitioner, other specialist identified by the state). For children and adolescents who have chronic conditions but are not enrolled in a special education program (eg, children with diabetes mellitus or cystic fibrosis), determinations about providing modified meals are made on a case-by-case basis. To ensure that nutrition issues are addressed in the child's or adolescent's school program, nutrition goals and objectives should be incorporated in the Individualized Education Plan or 504 Accommodation Plan for children and adolescents who have significant dietary or feeding problems.[18,19]

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Diabetes Mellitus

Diabetes mellitus is a chronic disease in which the body does not produce or properly use insulin. Insulin is a hormone manufactured by the beta cells of the pancreas that the body requires to maximally use glucose from digested food as an energy source. Diabetes mellitus is characterized by elevated glucose in the blood and urine. The goal of treatment is to manage the factors that affect blood glucose levels (eg, insulin, food, physical activity) to promote near-normal levels. Although the exact cause of diabetes mellitus is not known, a genetic component of the disease is recognized; environmental and immunologic factors may also play roles.

There are 2 types of diabetes mellitus. With type 1 diabetes mellitus, the body does not produce any insulin, and daily insulin injections are required. In contrast, with type 2 diabetes mellitus, the body continues to produce insulin but is unable to make enough or properly use what is made.

SIGNIFICANCE

More than 23 million people in the United States have diabetes mellitus. Type 1 typically occurs in children, adolescents, and young adults and accounts for 5% to 10% of all cases of diabetes mellitus. Type 1 affects about 1 in every 400 to 600 children and adolescents.[1]

Type 2 has typically been diagnosed after age 40 and accounts for 90% to 95% of all cases of diabetes mellitus; however, because of the increasing prevalence of childhood and adolescent obesity, the number of children and adolescents with type 2 is increasing. Community programs that promote healthy eating behaviors, regular physical activity, and healthy weight management are important for the prevention of type 2. (See the Obesity chapter.)

The quality of care that children and adolescents with diabetes mellitus receive may affect their long-term health. Control of diabetes mellitus aims to prevent acute complications (eg, diabetic ketoacidosis and severe hypoglycemia, which may be life-threatening) and chronic microvascular and macrovascular complications, which can lead to blindness, kidney disease, nerve damage, amputations, heart disease, and stroke.

NUTRITIONAL ADEQUACY

The treatment of type 1 diabetes mellitus involves careful attention to insulin administration, food intake, and physical activity to promote acceptable blood glucose and lipid levels. Children and adolescents are encouraged to include foods from all the major food groups in their meals and snacks. The carbohydrate content of foods is monitored, either by carbohydrate counting, exchanges, or experience-based estimations.[2]

Many children and adolescents receive multiple injections of rapid-acting insulin before meals and large snacks, and longer-acting insulin once or twice a day. The dose of rapid-acting insulin is determined with an insulin-to-carbohydrate ratio and a correction factor to adjust for the premeal glucose level. Other regimens include (1) a fixed dose of rapid-acting insulin before meals and intermediate- or longer-acting insulin once or twice a day and (2) insulin pump therapy, which delivers a small basal dose of rapid-acting insulin continuously and bolus doses of insulin before meals. Blood glucose monitoring 4 or more times per day is recommended to help identify blood glucose patterns and to adjust insulin and/or food intake.

The treatment of type 2 diabetes mellitus focuses on using the most effective method to lower blood glucose levels, whether it is lifestyle changes (eg, reducing energy intake, increasing physical activity to increase energy expenditure), insulin, glucose-lowering medications, or a combination of these methods. Blood glucose monitoring varies from 2 to 4 times per day depending on the method.

The goals of medical management and nutrition therapy for both types of diabetes mellitus include continued normal growth and development, sexual maturation, reduction of hyperglycemic and hypoglycemic episodes, promotion of healthy eating and physical activity, and improvement of overall health and diabetes mellitus control to reduce the risk or delay the progression of complications.

Specific guidelines for energy intake vary with the age of the child or adolescent and should be individualized on the basis of an in-depth nutrition assessment and nutrition and physical activity history. Energy requirements should initially be based on the child's or adolescent's typical food intake, pattern of growth, level of physical activity, and estimated energy allowance for age and sex.[3] A child or adolescent who has lost weight before diagnosis often requires additional energy for catch-up weight gain. An overweight child or adolescent diagnosed with type 2 diabetes mellitus needs guidelines for lower energy intake to promote weight maintenance or healthy weight loss. The distribution of calories should be individualized according to desired glucose, lipid, and weight goals, but it should be similar to the distribution recommended for all healthy children and adolescents to promote a healthy lifestyle (approximately 45%–65% carbohydrates, 5%–30% protein, and 25%–40% fat).[4]

Sucrose substituted for other carbohydrates does not promote adverse hyperglycemia in persons with diabetes mellitus; therefore, foods containing sucrose are allowed in moderation, and the variety of foods permitted in diabetic meal plans has increased.[2] The use of the glycemic index, a way to compare how different carbohydrate-containing foods affect blood glucose levels, may provide a modest additional benefit over considering total carbohydrates alone.[2] Nutrition inadequacies may result from food intolerance, personal food preferences (eg, lactose intolerance, vegetarian eating practices), cystic fibrosis–related diabetes, subsequent diagnosis of celiac disease, or food insecurity. For these circumstances, the registered dietitian needs to provide nutrition guidance about healthy food choices, appropriate alternatives, and community resources.

SCREENING

During the early course of type 1 diabetes mellitus, children and adolescents may present with symptoms of polyuria, polydipsia, polyphagia, and weight loss. At this time, a random blood glucose level over 200 mg/dL (11.1 mmol/L) or a fasting plasma glucose over 126 mg/dL (7.0 mmol/L) is sufficient to make a diagnosis.[5] An elevated blood glucose value should be confirmed if other hyperglycemic symptoms are not present. Early diagnosis reduces the risk of more dangerous conditions (eg, increased weight loss, dehydration, diabetic ketoacidosis).

According to the American Diabetes Association, children and adolescents should be screened for type 2 diabetes mellitus if they are overweight (ie, body mass index greater than the 85th percentile for age and gender, weight for height greater than the 85th percentile, or weight greater than 120% of ideal for height) and have 2 of the following risk factors[6]:

- Family history of type 2 diabetes mellitus in first- or second-degree relatives
- Belonging to a certain racial or ethnic group (ie, Native American, African American, Latino, Asian American, Pacific Islander)

- Signs of insulin resistance or conditions associated with insulin resistance (eg, acanthosis nigricans, hypertension, dyslipidemia, polycystic ovary syndrome, or small for gestational age birth weight)
- Maternal history of diabetes or gestational diabetes mellitus

Screening should be done every 3 years starting at age 10 or at the onset of puberty, whichever occurs first.[6]

ANTICIPATORY GUIDANCE

Anticipatory guidance is essential to the effective self-management of both types of diabetes mellitus and should be presented in stages.[3] Family members will need to help young children with type 1 diabetes mellitus administer insulin and help young children with type 2 diabetes mellitus administer glucose-lowering medications. In addition, family members will need to help young children monitor their blood glucose levels, food intake, and physical activity. The daily tasks of diabetes mellitus management should be taught gradually, and the responsibility for care should be shared with the maturing older child or adolescent.

Initial anticipatory guidance is provided at diagnosis and prepares the child or adolescent and family for living with diabetes mellitus. During this stage, the family should be taught basic management skills (eg, insulin administration, blood glucose monitoring, meal and snack planning). Anticipatory guidance should focus on eating regular meals and snacks; learning to identify carbohydrate-containing foods and portion sizes; and knowing how to recognize, prevent, and treat low blood glucose levels. Carbohydrate intake is tracked to help adjust rapid-acting insulin doses. Carbohydrate intake may vary from meal to meal, or it may be set at a consistent amount for those on fixed insulin doses or with weight-management goals. Recommended educational materials for the initial and subsequent stages are available from the American Diabetes Association, the American Dietetic Association, and other sources (see Suggested Reading).

Once the child or adolescent and family demonstrate a basic understanding of diabetes mellitus and can follow the day-to-day tasks required for its control, anticipatory guidance should be offered to teach insulin adjustment, expand food choices, and allow flexibility in scheduling meals and physical activity. The registered dietitian can provide anticipatory guidance on eating away from home, buying school lunches, eating at fast-food and other restaurants, converting nutrient information on food labels to carbohydrate equivalents, adjusting food and insulin for increased physical activity, and planning sick-day meals. Attendance at diabetes camps provides another opportunity for children and adolescents to develop skills for daily management of diabetes.

Anticipatory guidance for multiple daily insulin injections and pump therapy should be provided to those who demonstrate competency in daily management and are highly motivated to achieve near-normal blood glucose levels.[3] The focus at this stage is blood glucose pattern identification and evaluation and the promotion of increasingly sophisticated decision-making about adjusting insulin, food intake, and physical activity. The registered dietitian can provide more information about the effect of food on blood glucose levels, ways to estimate carbohydrate intake more precisely, and ways to calculate carbohydrate-to-insulin ratios. Because the documented side effects of improved glucose control are an increase in hypoglycemic episodes and unwanted weight gain, intensive nutrition anticipatory guidance should also include guidance on preventing and managing low blood sugar and managing weight.

INFANCY

Infants are dependent on parents to manage their diabetes. Because they cannot communicate when they experience symptoms of hypoglycemia, blood glucose goals are more liberal (100–200 mg/dL). Hypoglycemia should be first treated by giving the infant one-half of a carbohydrate serving (eg, 2 oz apple juice), but more may be given if the infant's blood glucose is still low after 15 minutes.

Breast milk or infant formula is recommended throughout the first year of life, and new supplemental foods and textures should be introduced as developmentally appropriate. Parents should be taught how to read nutrition labels to determine the carbohydrate content of infant formula and baby foods (eg, one carbohydrate serving equals 15 g carbohydrate). Rapid-acting insulin is often given after feeding to offset the infant's food intake.

EARLY CHILDHOOD

Young children may exert their independence by refusing to eat certain foods or meals, and the amount and variety of food eaten may vary considerably depending on food habits, changes in routines, and level of physical activity. Younger children may also have difficulty recognizing and verbally labeling symptoms of hypoglycemia; therefore, blood glucose goals are usually higher for this age group than for older children.

With a focus on carbohydrate intake, the registered dietitian can provide meal patterns that specify the number of carbohydrate servings and ranges for meat and fat servings. Families should be taught that, in terms of the carbohydrate content of food, one bread serving equals one fruit serving equals one milk serving.[7] This information helps increase food choices and may avert food battles and rejection of food. Families should also be advised that most young children need at least 3 snacks per day and that flexibility in food choices will help ensure the child's cooperation.

MIDDLE CHILDHOOD

Children become more emotionally independent between ages 7 and 12. Motor, reading, math, and reasoning skills increase quickly, as do independence and pride in one's accomplishments. Eating at school needs to be managed carefully to promote the child's sense of well-being. Children want to eat what the other children are eating. The registered dietitian can help plan a meal pattern for lunch that matches the standard lunch served at school. The registered dietitian can also recommend convenient, favorite foods for snacks at school (eg, granola bars, crackers, cookies) to promote consistency of food intake. On gym days, an extra 15-g carbohydrate snack should be provided before the physical activity to help prevent exercise-induced hypoglycemia. However, this additional carbohydrate may not be necessary if the child's blood glucose level is greater than 100 mg/dL.[3] It is often helpful for the registered dietitian to collaborate with school personnel (eg, teachers, food service workers) to explain the dietary management goals for the child.

Children with type 2 diabetes mellitus need continuous support and encouragement from the family to promote healthy behaviors that include a moderate carbohydrate and fat intake, regular physical activity, and decreased sedentary activities.

ADOLESCENCE

Adolescence is a time for further developing one's sense of identity and increasing autonomy and independence. More time is spent with friends, and the family's influence is diminished. Because social activities often revolve around food, adolescents with type 1 diabetes mellitus respond better to a flexible meal plan that permits choice and spontaneity. Snacks may be omitted in the morning and the afternoon depending on blood glucose levels, physical activity, and weight management goals. However, the evening snack should usually be kept to help decrease the risk of hypoglycemia during the night. The risk of eating disorders needs to be recognized and addressed; adolescents with diabetes mellitus may try to manage their weight by reducing or skipping their insulin. Older adolescents with varying work and school schedules may appreciate the more flexible multiple daily insulin injection regimens or insulin pump therapy. This intensification of management will need to be coordinated with the health professional, and additional education about carbohydrates and insulin adjustment will need to be provided.

Adolescents with type 2 diabetes mellitus need continuous support and encouragement from the family to promote healthy behaviors that include a moderate carbohydrate and fat intake, regular physical activity, and decreased sedentary activities.

REFERRAL

Referral to an interdisciplinary pediatric diabetes mellitus management program with a pediatric endocrinologist, nurse, registered dietitian, and social worker should be considered for the following groups (see Tool J: Nutrition Resources):

- Infants, children, and adolescents with newly diagnosed type 1 or type 2 diabetes mellitus
- Infants, children, and adolescents who receive multiple daily insulin injections or insulin pump therapy for improved glucose control
- Older children and adolescents with frequent hospitalizations for ketoacidosis or severe hypoglycemia
- Children and adolescents with psychosocial problems

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Helping an Active Adolescent Manage Diabetes

Charlie Davis is an active 14-year-old who loves to play basketball. One evening, he tells his parents that he wants to try out for the basketball team. The coach has seen Charlie play basketball with his classmates and thinks that he has potential. Mr and Mrs Davis are happy but also concerned. Charlie was diagnosed with diabetes 6 months ago. It took the family almost 2 months to learn how to balance his food intake and insulin dose to keep his blood glucose in a healthy range. If Charlie decides to play basketball, the family might have to change its routine again.

Members of the health care team recommend more frequent blood glucose monitoring to learn the affect of physical activity on his blood glucose levels.

Mr and Mrs Davis call their physician, Dr Yamaguchi, for advice. They ask how risky it would be for Charlie to play on a basketball team and how it could affect his blood glucose levels. Dr Yamaguchi assures them that many adolescents with diabetes are physically active. He suggests that Charlie and his parents come in for a visit if he makes the basketball team.

Charlie makes the team, and his parents reluctantly agree to let him play if he learns how to adjust his food intake and insulin dose. At Dr Yamaguchi's office, members of the health care team recommend more frequent blood glucose monitoring to learn the affect of physical activity on his blood glucose levels. They teach Charlie how to treat a low blood glucose reaction (hypoglycemia), and the importance of carrying fast-acting carbohydrate snacks with him to consume when he has hypoglycemia. His eating schedule is altered to include a snack before and after each practice and game. Charlie also learns how to choose appropriate foods from fast-food and other restaurants in case his team goes out to eat, and he learns that postexercise hypoglycemia may occur 3 to 12 hours after unusually intense or long workouts. Dr Yamaguchi suggests that Charlie and his parents talk with the coach about Charlie's needs and that the coach be taught how to identify and treat hypoglycemia. Dr Yamaguchi also asks Charlie to schedule a follow-up visit in 1 month.

During the follow-up visit, Charlie reports that it took a couple of weeks for him to learn what types of pregame snacks he needs to keep his blood glucose level from dropping too low but that he has not had a low blood glucose reaction since the second week of practice, which was 2 weeks ago. He is excited to share that he has been chosen as a starting player for the team.

Eating Disorders

Unhealthy eating behaviors and preoccupation with body size can lead to life-threatening eating disorders including anorexia nervosa, bulimia nervosa, and eating disorder not otherwise specified, as described in the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision (DSM-IV-TR).*[1,2] Binge-eating disorder, a more recently defined eating disorder, was granted provisional status in the *DSM-IV-TR*.[2] This disorder is not as well understood as other eating disorders owing to the relatively recent addition of this diagnosis. (See Boxes 1–4 for *DSM-IV-TR* criteria for anorexia nervosa, bulimia nervosa, eating disorders not otherwise specified, and binge-eating disorder.)

SIGNIFICANCE

Eating disorders have been observed in both sexes and across socioeconomic and racial/ethnic groups. Anorexia nervosa and bulimia nervosa affect between 2% and 4% of the population.[3] Eating disorder not otherwise specified, a common diagnosis encompassing half or more of all cases of eating disorders, may affect up to an additional 5% of the population.[3,4] Finally, binge-eating disorder affects an estimated 3% to 5% of the general population and approximately 30% of adults actively trying to lose weight.[5]

Disordered eating behaviors, such as self-induced vomiting, binge-eating, laxative use, or fasting, are prevalent among adolescents. Research has shown that 12% of adolescent females and 5% of adolescent males report engaging in these behaviors.[6] With anorexia

BOX 1. DIAGNOSTIC CRITERIA FOR 307.1 ANOREXIA NERVOSA[a]

A. Refusal to maintain body weight at or above a minimally normal weight for age and height (eg, weight loss leading to maintenance of body weight less than 85% of that expected; or failure to make expected weight gain during period of growth, leading to body weight less than 85% of that expected). B. Intense fear of gaining weight or becoming fat, even though underweight. C. Disturbance in the way in which one's body weight or shape is experienced, undue influence of body weight or shape on self-evaluation, or denial of the seriousness of the current low body weight. D. In postmenarcheal females, amenorrhea, ie, the absence of at least three consecutive menstrual cycles. (A woman is considered to have amenorrhea if her periods occur only following hormone administration.)	*Specify type:* **Restricting Type:** During the current episode of Anorexia Nervosa, the person has not regularly engaged in binge-eating or purging behavior (ie, self-induced vomiting or the misuse of laxatives, diuretics, or enemas). **Binge-Eating/Purging Type:** During the current episode of Anorexia Nervosa, the person has regularly engaged in binge-eating or purging behaviors (ie, self-induced vomiting or the misuse of laxatives, diuretics, or enemas).

[a]Reprinted, with permission, from: American Psychiatric Association.[2]

BOX 2. DIAGNOSTIC CRITERIA FOR 307.51 BULIMIA NERVOSA[a]

A. Recurrent episodes of binge eating. An episode of binge eating is characterized by both of the following:
   (1) Eating, in a discrete period of time (eg, within any 2-hour period), an amount of food that is definitely larger than most people would eat during a similar period of time and under similar circumstances
   (2) A sense of lack of control over eating during the episode (eg, a feeling that one cannot stop eating or control what or how much one is eating)
B. Recurrent, inappropriate compensatory behavior in order to prevent weight gain, such as self-induced vomiting; misuse of laxatives, diuretics, enemas, or other medications; fasting; or excessive exercise.
C. The binge-eating and inappropriate compensatory behaviors both occur, on average, at least twice a week for 3 months.
D. Self-evaluation is unduly influenced by body shape and weight.
E. The disturbance does not occur exclusively during episodes of Anorexia Nervosa.

Specify type:

Purging Type: During the current episode of Bulimia Nervosa, the person has regularly engaged in self-induced vomiting or the misuse of laxatives, diuretics, or enemas.

Nonpurging Type: During the current episode of Bulimia Nervosa, the person has used other inappropriate compensatory behaviors, such as fasting or excessive exercise, but has not regularly engaged in self-induced vomiting or the misuse of laxatives, diuretics, or enemas

[a]Reprinted, with permission, from: American Psychiatric Association.[2]

BOX 3. DIAGNOSTIC CRITERIA FOR 307.50 EATING DISORDER NOT OTHERWISE SPECIFIED[a]

The Eating Disorder Not Otherwise Specified category is for disorders of eating that do not meet the criteria for any specific eating disorder. Examples include

1. For females, all of the criteria for Anorexia Nervosa are met except the individual has regular menses.
2. All of the criteria for Anorexia Nervosa are met except that, despite significant weight loss, the individual's current weight is in the normal range.
3. All of the criteria for Bulimia Nervosa are met except that the binge-eating and inappropriate compensatory mechanisms occur at a frequency of less than twice a week or for a duration of less than 3 months.
4. The regular use of inappropriate compensatory behavior by an individual of normal body weight after eating small amounts of food (eg, self-induced vomiting after the consumption of two cookies).
5. Repeatedly chewing and spitting out, but not swallowing, large amounts of food.
6. Binge-eating disorder: recurrent episodes of binge-eating in the absence of the regular use of inappropriate compensatory behaviors characteristic of Bulimia Nervosa.

[a]Reprinted, with permission, from: American Psychiatric Association.[2]

nervosa, estimates of mortality rates from all causes vary greatly, averaging 5% to 8%, with some as high as 20%.[7–10] These deaths may be due to cardiac arrhythmia, acute cardiovascular failure, gastric hemorrhaging, or suicide. The major medical complications seen in individuals with eating disorders include the following[11]:

- Cardiac arrhythmia
- Dehydration and electrolyte imbalances
- Delayed growth and development
- Endocrinologic disturbances (eg, menstrual dysfunction, hypothermia)
- Gastrointestinal problems
- Oral health problems (eg, enamel demineralization, salivary dysfunction)
- Osteopenia, osteoporosis
- Protein/calorie malnutrition and its consequences

NUTRITIONAL ADEQUACY

The actual food intake of children and adolescents with eating disorders varies considerably and is difficult to assess due to secrecy, shame, and the inability to accurately quantify food consumed. Food intake is influenced by food

BOX 4. DIAGNOSTIC RESEARCH CRITERIA FOR BINGE-EATING DISORDER[a]

A. Recurrent episodes of binge-eating. An episode of binge eating is characterized by both of the following:
   (1) Eating, in a discrete period of time (eg, within any 2-hour period), an amount of food that is definitely larger than most people would eat during a similar period of time and under similar circumstances
   (2) A sense of lack of control over eating during the episode (eg, a feeling that one cannot stop eating or control what or how much one is eating)

B. The binge-eating episodes are associated with three (or more) of the following:
   (1) Eating much more rapidly than normal
   (2) Eating until feeling uncomfortably full
   (3) Eating large amounts of food when not feeling physically hungry
   (4) Eating alone because of being embarrassed by how much one is eating
   (5) Feeling disgusted with oneself, depressed, or guilty after overeating
   (6) Experiencing marked distress regarding binge eating
   (7) Occurring, on average, at least two days a week for six months

C. The method of determining frequency differs from that used for bulimia nervosa; future research should address whether the preferred method of setting a frequency threshold is counting the number of days on which binges occur or counting the number of episodes of binge-eating.

D. The binge-eating is not associated with the regular use of inappropriate compensatory behaviors (eg, purging, fasting, excessive exercise) and does not occur exclusively during the course of anorexia nervosa or bulimia nervosa

[a]Reprinted, with permission, from: the American Psychiatric Association.[2]

avoidance, the duration of restrictive eating episodes, the presence of binge-eating, and other factors. Although children and adolescents with eating disorders often have unhealthy eating behaviors, supplements are not a substitute for a healthy balanced diet.

Following are the nutritional inadequacies commonly seen in children and adolescents with eating disorders:

- *Energy.* Low energy intake, sometimes less than 500 calories per day, is a hallmark of anorexia nervosa.
- *Protein.* Protein intake is often low enough to result in clinical signs of protein deficiency in children and adolescents with restrictive types of eating disorders. Meat, poultry, fish, eggs, and dairy products are good sources of protein that children and adolescents with eating disorders sometimes avoid.
- *Calcium.* Because children and adolescents with eating disorders typically have insufficient dietary calcium intake, which can cause bone mineral loss, it is essential to maximize intake of milk, yogurt, and other dairy products and to use calcium supplements if needed.
- *Zinc.* When protein intake is low, zinc intake is usually limited as well. It is especially important to promote zinc- and protein-rich foods (eg, milk, meat, whole grains) because of zinc's role in taste dysfunction, appetite, and growth.
- *Vitamin B_{12}.* Intake of vitamin B_{12} may be a concern only in those with restrictive eating practices who are also strict vegetarians and who may not consume enough dairy products or eggs to obtain the recommended daily allowance of vitamin B_{12}. (See the Vegetarian Eating Practices chapter.)

DIAGNOSTIC CRITERIA

Eating concerns and disorders lie on a continuum ranging from mild dissatisfaction with one's body shape to serious eating disorders such as anorexia nervosa, bulimia nervosa, binge-eating disorder, and eating disorder not otherwise specified. Along the continuum between these endpoints lie normative dieting behaviors and disordered eating behaviors, such as self-induced vomiting, fasting, or laxative use. While engaging in disordered eating behaviors does not necessarily mean that an individual can be formally

diagnosed with a clinical eating disorder, such behaviors can negatively impact adolescents' growth potential, mental health status, and long-term physical health.[11] Furthermore, children and adolescents who engage in these behaviors are more likely than their peers to develop a formally diagnosed clinical eating disorder.[12]

SCREENING AND ASSESSMENT

Early identification of children and adolescents with eating disorders has been linked to better long-term outcomes. However, it can be difficult to identify children and adolescents who have eating disorders because they may avoid medical visits; present with gastrointestinal complaints, amenorrhea, or sports injuries; or ask for a diet or drugs to help them lose weight. Parents sometimes seek medical help for their children or adolescents because of concerns about unexplained weight loss or suspicion of self-induced vomiting.

SCREENING

Eating disorder screening, which can be incorporated into any health visit, includes many components of an annual physical or sports checkup. In addition to conducting the physical examination (including determination of body mass index [BMI] for age percentile), the health professional should talk with the child or adolescent to obtain information about body image and weight history, eating behaviors and meal patterns, physical activity, and health history, and should administer a brief psychosocial assessment. If any warning indicators of eating disorders are present (Tables 1 and 2), the health professional needs to evaluate further, with the use of the assessments that follow.

The presence of a warning sign does not always indicate an eating disorder. Physically active children and adolescents may experience occasional gastrointestinal complaints, dizziness, irregular meal patterns, and menstrual irregularities without having an eating disorder. Consultation with health professionals experienced in eating disorders can help distinguish "typical" child or adolescent eating behaviors from disordered eating behaviors or an eating disorder.

Bulimia nervosa can damage teeth, as vomiting exposes the teeth to acidic vomitus, which demineralizes the enamel and slowly dissolves the teeth. The health professional should refer an individual to a dentist if damage is apparent. With bulimia nervosa, enlargement of the parotid glands may also be present.

ASSESSMENT

If the child or adolescent is at high risk for an eating disorder (based on the warning signs listed in Tables 1 and 2), a number of assessments should be performed in addition to the initial screening. These assessments are best done by an interdisciplinary team of health specialists working together to evaluate the child or adolescent at high risk. Both adolescents and their parents need to be interviewed, but it is recommended that adolescents and their parents be interviewed individually.

MEDICAL HISTORY AND PHYSICAL ASSESSMENT

- Rule out organic illness as an explanation for weight loss or menstrual abnormalities.
- Ask about history of binge-eating and/or compensatory behaviors (eg, self-induced vomiting; laxative, diuretic, or diet pill use; excessive physical activity). If the child or adolescent is diabetic with elevated hemoglobin A_{1C} levels, evaluate the possibility of insulin-withholding as a means of weight control.
- Repeat assessment for orthostatic changes in pulse and blood pressure.
- Laboratory tests are not definitive markers for diagnosing the presence of eating disorders; children and adolescents with eating disorders often have results within the normal range when screened with the following tests[15]:
  - *Amylase.* Pancreatic amylase is elevated in some children or adolescents who vomit regularly.
  - *Calcium and magnesium.* Hypocalcemia (decreased calcium in the blood) and hypomagnesemia (decreased magnesium in the blood) may be observed with laxative abuse, malnutrition, and inadequate nutrition intake. However, absence of hypocalcemia should not be misconstrued to mean

TABLE 1. ANOREXIA NERVOSA: SCREENING ELEMENTS AND WARNING SIGNS[a]

Screening Elements	Warning Signs
Body image	Distorted body image Extreme dissatisfaction with body shape or weight Profound fear of gaining weight or becoming fat
Eating and related behaviors	Very low caloric intake Fasting or restrictive dieting Denial of hunger cues Erratic meal patterns or frequent meal-skipping Poor appetite Difficulty eating in front of others Food seen as good or bad
Health history/examination	Body mass index <20th percentile Unexplained weight change Amenorrhea Fainting episodes or frequent lightheadedness Constipation or diarrhea Bloating/nausea Hypothermia; cold intolerance Orthostatic hypotension (>10 mm Hg after posture changes) Bradycardia (resting heart rate of ≤60 beats/minute)
Physical activity behaviors	Participation in physical activity with weight or size requirement (eg, gymnastics, wrestling, ballet) Overtraining or compulsive attitude about physical activity
Psychosocial	Depressed affect Frequent thoughts about food or weight Feeling pressure from others to be a certain shape or weight Perfectionist History of physical or sexual abuse or other traumatizing life event

[a]Sources: American Psychiatric Association[13] American Dietetic Association,[14] and American Medical Association.[15]

that dietary intake is adequate, as loss of calcium from bones precedes a decrease in calcium in the blood.

- *Bicarbonate.* High levels of bicarbonate may be observed in individuals who purge either with diuretics or with vomiting. Low levels of bicarbonate may be observed in individuals who misuse laxatives.
- *Potassium.* Hypokalemia (decreased potassium in the blood) may be observed with prolonged malnutrition or with purging.
- *Urine ketones.* These compounds may be elevated because of chronic fasting or inadequate intake.
- *Urine specific gravity.* This measurement may be elevated (suggesting dehydration) or may be low because of excessive fluid intake.
- Assess the need for hospitalization.[16] (See the Referral and Management section on the following page.)

NUTRITION ASSESSMENT

Request a 3- or 5-day food/physical activity record that provides information on the specific types and quantities of food consumed, as well as the places and times food was eaten, the number of other people present, and the types of physical activities performed during that time. Some children and adolescents do not want to talk about their eating and physical activity behavior and are more likely to answer health-focused questions phrased in a supportive, nonblaming way. For example, "To make sure your body is getting everything it needs, I'm going to ask you a couple of questions about what you are eating and drinking. Can you tell me everything you had to eat and drink yesterday?" A food-frequency questionnaire could also be used to establish eating patterns over the past month.

TABLE 2. BULIMIA NERVOSA: SCREENING ELEMENTS AND WARNING SIGNS[a]

Screening Elements	Warning Signs
Body image	Distorted body image Extreme dissatisfaction with body shape or weight Profound fear of gaining weight or becoming fat
Eating and related behaviors	Wide variations in caloric intake Fasting or restrictive dieting (episodic) Binge-eating Unexplained disappearance of large quantities of food Denial of hunger cues Erratic meal patterns or frequent meal-skipping Poor appetite Difficulty eating in front of others Food seen as good or bad
Health history/examination	Unexplained weight change or fluctuations >10 lbs Irregular menses Constipation or diarrhea Bloating/nausea/abdominal pain Dental caries Orthostatic hypotension (changes >10 mm Hg after posture changes)
Physical activity behaviors	Participation in physical activity with weight or size requirement (eg, gymnastics, wrestling, ballet) Overtraining or compulsive attitude about physical activity
Psychosocial	Depressed affect Frequent thoughts about food or weight Feeling pressure from others to be a certain shape or weight Perfectionist History of physical or sexual abuse or other traumatizing life event

[a]Sources: American Psychiatric Association[13] American Dietetic Association,[14] and American Medical Association.[15]

- Assess the presence of fear of certain foods by asking the child or adolescent if there are foods they feel safe eating versus foods they fear eating.
- Ask the child or adolescent to describe any food-related rituals or food rules that she follows. Discuss when these rituals or rules first presented themselves.
- Take the child's or adolescent's health and weight history, including history of binge-eating, purging (eg, self-induced vomiting), use of laxatives or diuretics, and level of physical activity.
- Rule out clinical nutrition deficiencies as causes of symptoms such as hair loss or dry skin.

PSYCHOSOCIAL ASSESSMENT

- Interview the child or adolescent and the parents about circumstances surrounding the onset of changes in eating behavior or weight.[13]
- Assess for depression, and rule out other psychiatric disorders (eg, anxiety disorder, obsessive-compulsive disorder, bipolar disorder) as primary or comorbid conditions that might explain changes in eating behavior and preoccupation with body weight and shape.[13]
- Assess risk of suicide.[13]

REFERRAL AND MANAGEMENT

Comprehensive assessment and treatment require an interdisciplinary team that has experience in treating eating disorders in children or adolescents and that can provide nutrition anticipatory guidance, medical care and monitoring, psychiatric evaluation, and individual and/

or family therapy. Referral to an eating disorder treatment program should be considered if an interdisciplinary team is not available or if hospitalization is indicated.

Hospitalization may be needed if the child or adolescent is severely malnourished, shows metabolic disturbances, or has a significant psychiatric comorbidity.[17] If the child or adolescent has anorexia nervosa, it is essential to ensure a gradual and carefully planned return to normal eating to prevent the "refeeding syndrome" associated with hypophosphatemia. Close monitoring of food intake and output, fluid status, physical activity, and body weight is necessary to accurately adjust the dietary recommendations for steady weight gain.

At minimum, children and adolescents with eating disorders need to be evaluated and followed long term by a physician, a mental health professional (including at least one evaluation by a psychiatrist), and a dietitian. Because of the complexity of these disorders and the need to set clear, consistent behavioral limits, teamwork is essential.

ANTICIPATORY GUIDANCE

The main goals in providing anticipatory guidance to children and adolescents with eating disorders are to enable them to achieve and maintain a BMI within the normal range (between the 15th and 85th percentiles), function well at school or work, and resume healthy eating behaviors. Nutrition anticipatory guidance needs to be individually tailored and should be coordinated with the medical and psychiatric/psychological management of the child or adolescent. Following are 4 interim nutrition goals for children or adolescents who have eating disorders, with specific strategies registered dietitians can use to help them achieve these goals:

- Improve and restore nutritional adequacy.
  - Set guidelines for food intake, based on the number of servings of specific foods (not calories).
  - Recommend taking a vitamin and mineral supplement daily.
  - Encourage children and adolescents to select foods that meet daily nutrition needs.
- Maintain body weight (avoid additional weight loss or large weight fluctuations).
  - Challenge the child's or adolescent's body image, comparing it with appropriate body weights and shapes.
  - Encourage the child or adolescent to avoid self-weighing.
  - Dispel myths about how weight loss occurs, and explain why bodies store fat and why some fat from food is essential.
- Decrease the frequency of binge-eating and compensatory behaviors.
  - Encourage the child or adolescent to eat 3 scheduled meals and 1 or 2 snacks each day.
  - Help the child or adolescent identify situations that may trigger binge-eating (eg, parties), and plan ways to manage these situations.
- Seek support from the family.
  - Discourage family members from making comments to the child or adolescent about appearance, weight, or eating behaviors.
  - Ask parents to remove all diet products and books, diet foods, and diet pills from the home.
  - Establish and maintain regular family meals.

Health professionals can help prevent eating disorders by promoting a positive body image and healthy attitudes toward food and physical activity.

INFANCY AND EARLY CHILDHOOD

Parents are usually very aware of their young children's eating habits and may have concerns about nutritional adequacy of their diets, their risk of obesity, or their avoidance of foods. Eating disorders are not evident during this time.

- Emphasize the wide range of normal body weights for infants and children, and reassure parents who mistakenly believe their infant or child is overweight.
- Discourage restricted eating regimens for healthy infants and children.
- Promote feeding relationships that let infants and children respond to hunger and satiety cues.
- Encourage families to eat meals together regularly. Discuss ways to keep mealtimes pleasurable and to minimize struggles around food.
- Instruct family members not to tease the child about body weight, shape, or physical appearance and to avoid unhealthy dieting themselves.

- Encourage parents to emphasize regular physical activity and promote a positive body image.
- Discourage the use of food to manipulate behavior, either as punishment or as incentive.

MIDDLE CHILDHOOD

The eating and physical activity behaviors of children ages 5 to 10 are greatly affected by their expanding social world, and parents may feel they do not have much influence during this time. Parents need to be reminded that family behaviors and attitudes still significantly shape children's behaviors, and children should be encouraged to have a positive attitude toward food and a positive body image. Although eating disorders are less common in middle childhood than in adolescence, attitudes about body shape and size are developing, and experimentation with dieting has been observed.

- Suggest that parents review the kinds of foods available at home, especially snack foods and foods packed in school lunches. Encourage a balance of healthy foods.
- Discourage meal-skipping or other restrictive eating behaviors, and encourage families to eat meals together whenever possible, at least once a day.
- Instruct family members not to tease the child about body weight, shape, or physical appearance and to avoid unhealthy dieting themselves.
- For 8- to 10-year-olds, briefly outline the ways their bodies will be changing as they experience puberty.
- Encourage regular physical activity for both the child and the family, with an emphasis on activities that the child enjoys and that contribute to overall fitness. (See the Healthy Eating and Physical Activity chapter.)

ADOLESCENCE

Puberty is the major physical hallmark of adolescence, with the normal biological changes sometimes viewed negatively by females (eg, body fat deposits, menses) or more positively by males (eg, greater height and muscle mass). Food and physical activity behaviors are often driven by the desire for physical attractiveness, by sports performance, and by friends' behaviors. Eating disorders develop most often during adolescence. Both adolescents and their parents need nutrition anticipatory guidance, but it is recommended that adolescents receive guidance individually.

- Describe pubertal changes, preferably before they occur, and be available as a "safe" person with whom adolescents can talk about body issues. With females, emphasize that body fat increases during this growth period; with males, discuss the wide variability in the timing of growth and maturation.
- Use BMI charts to assess an adolescent's relative weight, and discuss the broad range of weights considered normal for body shape and size.
- Discourage restrictive dieting or meal-skipping.
- Encourage regular, but not excessive, physical activity to maintain health and weight.
- Instruct family members to avoid teasing the adolescent about body weight, shape, or physical appearance and to avoid unhealthy dieting themselves.
- For overweight adolescents, carefully phrase recommendations for weight loss, and help them identify behaviors they can change.

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Food Allergy

Adverse food reaction is the term used to classify abnormal reactions caused by foods. Adverse food reactions are broken down into 2 categories: food allergy/hypersensitivity and food intolerance. Food allergy is an adverse response to a food protein caused by the immune system. Food intolerance is an undesirable response to foods that is not immunologic in nature.

Antibodies (also known as immunoglobulins) are found in blood or other bodily fluids, and are used by the immune system to identify and neutralize foreign objects, such as bacteria and viruses. Immunoglobulin E (IgE) protects the body from parasites and parasitic worms. In some individuals, IgE becomes misdirected and attacks specific proteins. Food allergy/hypersensitivity refers to a condition in which a person's IgE reacts to the ingestion of a particular food protein, also called an allergen. An allergic reaction occurs within seconds to 1 to 2 hours after exposure to a food protein or allergen. Trace amounts of the allergenic food may be enough to trigger a mild or life-threatening reaction (anaphylaxis). Symptoms from allergic reactions can be detected in the skin (eg, hives), respiratory tract (eg, congestion, wheezing), gastrointestinal (eg, swelling of lips, vomiting), and/or cardiovascular (eg, shock).

All nonimmune-mediated reactions to foods are referred to as food intolerance or nonallergic food hypersensitivity. This includes (a) symptoms caused by the lack of an essential enzyme (eg, lactose intolerance), (b) reactions to pharmacologically active chemicals in foods (eg, monosodium glutamate), (c) reactions to naturally occurring pharmacologically active agents in foods (eg, caffeine), and (d) reactions to toxic compounds in foods (eg, aflatoxin). The adverse response is usually dose-dependent.

SIGNIFICANCE

The incidence of food allergies and other atopic diseases, such as asthma and atopic dermatitis, are increasing.[1,2] Approximately 6% of infants and children in the United States have food allergies. Common allergies include milk, eggs, soy, and wheat; however, most children become tolerant to these foods by school age or late childhood.[3,4] Approximately 20% of children who are allergic to peanuts become tolerant to them by school age.[5] Allergies to tree nuts, fish, and shellfish tend to develop in older children and are considered lifelong allergies.

The quality of life for a family with a child who has food allergy is affected in a variety of ways.[6] There are health and nutrition concerns, emotional issues (eg, anxiety about reactions, dealing with the community), and worrying that the child's food allergy will be lifelong.

Currently, avoidance of all forms of the food allergen is the only way to prevent a food allergic reaction. Medical treatment may be necessary during an allergic reaction. Dietary consultation provides the education necessary for the family to understand how to avoid the food allergen(s) and provide a balanced and nutritionally adequate diet for normal growth and development.

DIAGNOSIS

A thorough medical history, possibly a food diary, physical examination, laboratory studies, trial elimination diet, and oral food challenges are used to distinguish the type of adverse food reaction. An incomplete workup and unorthodox procedures can result in incorrect diagnoses, unnecessary diet restrictions and subsequent nutrient deficiencies, and delaying the treatment of a treatable disease.

The medical history identifies the suspected food(s) by obtaining information regarding the amount of the food ingested, length of time from ingestion to the development of symptoms, consistency of symptoms on other occasions when the food is eaten, and length of time since the last reaction. A diet diary can identify a food that is common to different products or reveal hidden sources of a food allergen. The diet diary needs to document the time of meals and snacks, foods consumed (including brand names and labels, condiments, or recipes), medications or supplements, and the timing of symptoms. A registered dietitian is an invaluable expert to assist in interpreting diet diaries.

The physical examination can identify atopic diseases such as atopic dermatitis (eczema), allergic rhinitis, and asthma, which increase the likelihood that the symptoms are related to a food allergy. Thirty-five percent of children with atopic dermatitis have food allergies as a trigger for their atopic dermatitis.[7]

Prick skin testing (PST) and radioallergosorbent test (RAST) both detect food-specific IgE. These skin and serum tests identify if a food is likely to be the cause for the allergic symptom. Negative results for either test confirm the absence of an IgE-mediated reaction. Both have a negative predictive value of 95%. A positive PST or RAST indicates the presence of food-specific IgE but does not confirm whether the food is responsible for the allergic symptoms. The positive predictive accuracy is less than 50%. An accurate medical history is critical to identify the suspicious foods instead of screening by using a large panel of tests that may provide a list of foods that are not responsible for the symptoms.

When the history of reaction to a specific food is apparent and is supported by a positive test, the workup can be considered complete. If the suspected foods are questionable, a trial elimination diet may be needed. The elimination diet removes all forms of the suspected food allergen(s) from the diet. The length of the trial may be 2 to 6 weeks based on the disorder (IgE-mediated food allergy vs enterocolitis). If the symptoms do not resolve, the likelihood of the eliminated foods causing the symptoms is low. If symptoms resolve and several foods were eliminated, oral food challenges may be needed to determine the cause of the symptoms.

Oral food challenges provide the most definitive means to diagnose a food allergy or other adverse reaction to foods. Open feedings, where everyone knows what is being fed, are appropriate for screening. The food challenge may need to be blinded, where the child doesn't know what is being fed, if open food challenges are positive.[8,9] All food challenges are at risk of anaphylaxis. Emergency medicines must be available before beginning a food challenge. Tolerance of a normal serving size of the food is used to determine if one is no longer sensitive to that allergen.

NUTRITIONAL ADEQUACY

Food allergies can be "prevented" by complete avoidance of the food allergen or allergens. The prescribed elimination diet may be the same one used to confirm the diagnosis. The number of foods being restricted and availability of appropriate food substitutes will determine the nutritional quality of the diet. If a child is allergic to a single food (eg, peanut, fish), the nutritional adequacy of the diet may not be compromised. But the elimination of milk, eggs, soybeans, or wheat can have a major impact on the quality of a diet. These foods are found in the food supply in many forms, making complete elimination more difficult.

Diet histories or food diaries are tools used to assess adequacy and appropriateness of the diet. Nutritional requirements of a child with a food allergy are no different than those of a child without a food allergy. Therefore, the Dietary Reference Intakes for energy, protein, fat, vitamins, and minerals are used to determine adequacy of the child's diet.[10] A child who is allergic to milk needs to have their diet evaluated for adequate intake of calcium and vitamin D, as well as protein, vitamin A, and riboflavin. A child is at greater nutrition risk if allergic to milk, eggs, peanut, and soy; not consuming a safe milk alternative; and not eating meats. This child's diet is at risk of being deficient in adequate protein; vitamins A, B, and D; calcium; iron; and zinc. Safe alternative sources of these nutrients should be incorporated into the child's diet. Allergen-free formulas, fortified foods, and allergen-free supplements may be needed if a child is unable to consume adequate amounts of specific nutrients from food.

MyPyramid for Kids is a helpful tool to determine if a child is consuming the appropriate number of servings from each food group for a balanced diet. This tool can be used for education on safe alternatives to offer the child.[11]

Anthropometrics, assessment of growth and development, and nutritional status should be performed by health professionals. Principles of assessing growth of children with food allergy are the same as those used for healthy children. (See the Nutrition Supervision chapters.)

ANTICIPATORY GUIDANCE

Nutrition anticipatory guidance is the cornerstone for good compliance. The child and family need to learn how to avoid all forms of the food allergen(s). This can be achieved by learning how to read a label and identify forms of the food to be avoided, sources of cross-contact, where allergens are hidden, and alternative food sources for nutrients.

The food label provides communication from the food industry to consumers about the product's ingredients. A food label must be read every time it is considered for purchase to determine if that product is free of the specific allergen. The Food Allergen Labeling and Consumer Protection Act requires that the major allergens (eg, milk, egg, wheat, soy, peanut, tree nuts, fish, seafood) be clearly identified on the food label.

Advisory labeling declares potential cross-contact such as "may contain (allergen)" or "produced in a facility that also produces (allergen)." Advisory labeling is voluntary and unregulated. Calling the manufacturers of these products to obtain more information is recommended.

Cross-contact occurs when an allergen-containing food comes in contact with a "safe" food. As a result, each food contains small and usually hidden amounts of the other food. This may occur with any manufactured food (eg, egg-containing and egg-free pastas, breakfast cereals with or without nuts). The primary cause of cross-contact in eating establishments is shared utensils and equipment. Purchasing sealed packages with ingredient labels from grocery stores is recommended to avoid cross-contact. Encourage the household to be allergen-free. Otherwise, the family should prepare safe foods first, avoid sharing utensils, and cover and remove safe food from the cooking area while the rest of the food is prepared.

Most accidental ingestions occur in restaurants. The parent of a child with a food allergy may want to contact the manager or chef to determine if the restaurant would be able to provide safe foods. It is best to avoid buffets and dishes with sauce, and select simple, single food items. Always bring safe foods in case there are problems.

During nutrition anticipatory guidance, the registered dietitian will review where food allergens are commonly found. It cannot be assumed that families know that milk is used to make butter or cheese. Many families rely on processed foods and do not know cooking basics (eg, eggs are used to make muffins). Cookbooks with allergen-free recipes are useful tools to help families prepare safe foods that look and taste like the commercially prepared allergen-containing foods.

PRENATAL AND INFANCY

It is usually unnecessary to restrict a woman's diet during pregnancy beyond eliminating the foods to which she is allergic. The benefits of nutritional intervention that may prevent or delay the onset of atopic disease are largely limited to infants at high risk of developing allergy (ie, infants with at least one parent or sibling with allergic/atopic disease). The current evidence suggests[12]

- Maternal dietary restrictions during pregnancy do not play a significant role in preventing atopic disease in infants.
- Exclusive breastfeeding of an infant at high risk for food allergies for at least 4 months compared with feeding an infant intact cow's milk protein formula decreases the cumulative incidence of atopic dermatitis and cow's milk allergy during the first 2 years of life.
- Extensively hydrolyzed formulas and, less effectively, partially hydrolyzed formulas may delay or prevent atopic disease compared with cow's milk formula.
- There is no evidence for the use of soy-based formula in allergy prevention.
- Delaying the introduction of solid foods until 4 to 6 months of age is appropriate; however, there is no evidence that delaying beyond this period provides a protective effect on the development of atopic disease regardless of whether the infant is breastfed or fed cow's milk protein formula. This includes delaying the introduction of foods that are considered to be highly allergenic foods, such as fish, eggs, and foods containing peanut protein.
- Data are insufficient to support a protective effect of any dietary intervention for prevention of atopic disease in infants after 4 to 6 months of age.

If an infant or child develops signs or symptoms of a food allergy triggered by the ingestion of food, the food allergen must be identified and restricted. For the infant diagnosed with a food allergy, exclusive breastfeeding should be encouraged for a minimum of 4 months. Foods confirmed to cause allergy symptoms in the infant should be eliminated from the mother's diet while she is breastfeeding. The mother will need nutrition anticipatory guidance to promote nutritional adequacy of her diet. If infant formula is required either to supplement breast milk or to be used exclusively, an extensive hydrolyzed protein-based formula is the best choice.

The introduction of solid foods can begin between 4 and 6 months of age. Parents should introduce one new single-ingredient food every 5 to 7 days and look for signs of intolerance (eg, rash, vomiting, diarrhea).

Mashed or chopped foods should be introduced in the diet around 9 months of age to avoid oral aversion to these foods. The child with food allergies learns how to eat a variety of foods, and there are fewer battles over food if everyone eats foods that are safe for the child at family meals. The home needs to be free of the specific food allergens or the allergenic foods need to be out of reach once the infant begins crawling.

EARLY CHILDHOOD

A clear division of responsibility in feeding must be established at this age. The parent determines the structure of meals and snacks and selects the foods to be offered, and the child determines the amount eaten.[13] When a child with a food allergy is able to choose freely from the foods offered at meals, or when family members have accommodated a food allergy by changing the way they eat, there is less likelihood of food-related struggles and risk of the child ingesting food she is allergic to. Young children need to be taught to not take food from anyone without a parent's approval.

Child care and school settings provide new challenges for children with food allergies. Encourage parents to meet with the child care or school personnel to discuss the child's food allergy. Provide all personnel with a food allergy action plan, provided by the child's physician, that outlines foods to avoid and how to treat an allergic reaction. Also encourage the family to review child care or school menus to identify food allergens and to suggest substitutions. Personnel also benefit from education on how to read food labels to identify food allergens and how to avoid unintentional ingestions (eg, not allowing trading or sharing of foods). Encourage the child to wear medical identification jewelry. Annual evaluations are recommended because many food allergies are outgrown later in childhood.[14]

MIDDLE CHILDHOOD AND ADOLESCENCE

Older children and adolescents with food allergies need to gradually assume responsibility for avoiding the foods they are allergic to. Risk-taking behaviors become greater when children and adolescents spend more time without supervision, which may lead to fatal allergic reactions.[15] Adolescents consider social isolation as the hardest part of living with a food allergy. Communication with friends about their food allergy lessens isolation. Reinforce that the symptoms are an allergic reaction, the importance of always carrying emergency medication (epinephrine), and when to use the medication. Reeducate them on the importance of reading labels, how to order a safe meal at a restaurant, and to not eat any food if they are not sure it is safe.

REFERRAL

Families of infants, children, and adolescents with food allergies can be referred to organizations such as the Food Allergy & Anaphylaxis Network, which provides educational materials with strategies for living with food allergies and networking opportunities for individuals with food allergies and their families. (See Tool J: Nutrition Resources.)

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Human Immunodeficiency Virus

Human immunodeficiency virus (HIV) attacks the immune system, the body's defense against infection, making the body less able to fight disease. HIV is considered to have progressed to acquired immune deficiency syndrome (AIDS) when a person develops an opportunistic infection (ie, one that might not have developed if HIV had not been present) or cancer, or when the person has a "helper" T-cell (CD4) count of less than 200/mm^3 of blood. T-cells help infection-fighting antibodies form in the blood; they are weakened or destroyed by HIV.

SIGNIFICANCE

The first cases of pediatric AIDS were reported in 1982. Since then, 15,860 cases of AIDS in infants, children, and adolescents have been reported to the Centers for Disease Control and Prevention.[1] From 2002 to 2006, the number of reported AIDS cases decreased in infants and children, but increased in adolescents. Among children, males account for 65% and females account for 35% of newly reported AIDS cases. Among adolescents, males account for 61% and females account for 39% of newly reported AIDS cases.[1]

African Americans in the United States are disproportionately affected by AIDS. Among newly reported AIDS cases in children, African-American children account for 73% of cases but for only 15% of the overall population. In contrast, Hispanic children account for 11% of cases and for 21% of the population, non-Hispanic white children account for 10% of cases and for 58% of the population, and Asian/Pacific Islander children account for 2% of cases and for 5% of the population. No new AIDS cases have been reported among American Indian/Alaska Native children, who account for 1% of the population.[1] Among newly reported AIDS cases in adolescents, African-American adolescents account for 69% of cases but for only 16% of the population. In contrast, Hispanics account for 19% of cases and for 17% of the population, non-Hispanic white adolescents account for 10% of cases and for 62% of the population, and Asian/Pacific Islander and American Indians/Alaska Native adolescents account for less than 2% of cases and for 5% of the population.[1]

Cultural, racial, and social and economic factors (eg, poverty, underemployment, lack of access to health care) must be considered in efforts to prevent and treat HIV. These factors affect the health status of all individuals, but they disproportionately affect the health status of African Americans, Hispanics, Alaska Natives, and American Indians.[2]

SYMPTOMS

Symptoms of untreated HIV infection in infants, children, and adolescents include the following:

- Failure to gain weight and grow
- Chronic diarrhea without a specific cause
- Enlarged liver and spleen, which appear as a swollen belly
- Swollen lymph nodes
- Chronic yeast infections (eg, candidiasis, thrush)
- Pneumonia and other bacterial, viral, fungal, and parasitic infections

Adolescents with HIV may also experience fever or flu-like symptoms shortly after they are first exposed to and infected by HIV (primary infection; "seroconversion syndrome"). In addition, developmental delays in children and adolescents are commonly seen when the nervous system is affected by HIV. Infants, children, and adolescents may be infected with HIV for many years before developing symptoms of HIV infection or developing AIDS.

TRANSMISSION

HIV is not transmitted by casual contact. More than 90% of infants and children with HIV become infected with the virus via their mothers during the period shortly before, during, or after birth in a process referred to as perinatal transmission.[1] If preventive measures (eg, antiretroviral use and elective caesarean section) are not taken, then pregnant women with HIV have a 15% to 25% risk of transmitting HIV to their infants during pregnancy or birth.[3] Most perinatal transmission of HIV occurs late in pregnancy or during birth.[4] How HIV is transmitted to the fetus or newborn is not entirely understood. It may be transmitted across the placenta to the fetus or by exposure of the infant to infected blood and secretions during labor and delivery.[4]

HIV virus may also be transmitted from mothers with HIV to their infants through breast milk. Breastfeeding may be responsible for at least 24% of all mother-to-infant HIV transmission in infants who are born to HIV-infected mothers and who are breastfed.[5] Many factors influence the risk of HIV transmission through breastfeeding. Factors that increase the risk of HIV transmission include[6]

- Longer duration of breastfeeding
- Poor maternal immune status (low CD4+ cell count)
- High HIV levels in the mother
- Poor breast hygiene (eg, mastitis, breast abscess, cracked or bleeding nipples)
- Mixed infant feeding (ie, giving the infant foods or beverages in combination with breast milk, especially within the first few months of life)
- Damage to the lining of the infant's mouth or gut (caused by infections, such as thrush or by consumption of foods or beverages other than breast milk)

The World Health Organization recommends that all women with HIV be advised of both the risks and benefits of breastfeeding so that they can make an informed decision. In areas where safe alternatives to breastfeeding (eg, infant formula and clean water) are available and affordable, breastfeeding should be avoided.[3]

Among infants and children in the United States, HIV is less commonly transmitted in the following ways:

- Breastfeeding
- Pre-mastication of food given to an infant or young child by a parent or care provider infected with HIV
- Puncturing of skin with a needle containing blood of a person infected with HIV
- Exposure of open skin or mucous membranes to body fluids (ie, blood, semen, vaginal fluid) of a person with HIV
- Receipt of blood or blood products of a person infected with HIV (eg, during treatment for coagulation disorders)

Most newly diagnosed adolescents contract HIV in the following 2 ways[1]:

- Exchange of body fluids (ie, semen, vaginal fluid) during sexual activity with a person who has HIV
- Sharing of HIV-contaminated needles for injection-drug use

TREATMENT

There is no cure for HIV, but with the continuous development of new and effective medications, it has become a manageable chronic disease for many people. Researchers continue to work on developing an HIV vaccine.[7] A number of drugs have been developed that fight HIV. Currently, there are 5 classes of drugs, with multiple drugs in each class. There are 25 different drugs approved for adolescents; 13 approved for children, and 9 approved for infants.[8,9] Each class of drugs works in a unique way to fight HIV, so it is common for multiple drugs from different classes to be prescribed at the same time.

Using multiple drugs from at least 2 to 3 different classes is the idea behind highly active antiretroviral therapy (HAART). HAART was developed to reduce a person's viral load to undetectable levels and to maintain these low levels longer than was previously possible.

Herbal products that claim to reduce the symptoms of HIV are not recommended for infants, children, or adolescents. Parents considering giving their infant, child, or adolescent with HIV an herbal product are encouraged to first discuss their plans with a health professional. It is important for parents and health professionals to maintain open communication about the use of such products, because little is known about their safety and efficacy or about how they interact with HIV medications. Some herbs may interfere with the body's ability to absorb medications; others may increase absorption. Herbs that interfere with the body's absorption of antiviral medications may allow HIV to multiply and become resistant. Herbs that increase medication absorption may cause severe medication side effects. In addition, the smaller size of infants, children, and adolescents with HIV (compared with adults with HIV) places infants, children, and adolescents at greater risk for overdose.

NUTRITION SUPERVISION

Nutrition status and HIV are interconnected. For those with HIV, poor nutrition can negatively affect the immune system and increase the risk for opportunistic infections. At the same time, HIV can cause malnutrition. HIV, HIV medications, and infections that are common with HIV can lead to malnutrition in the following ways[10]:

- Decreased food intake related to poor appetite, nausea, infections in the mouth or throat, or depression
- Loss of nutrients through vomiting or diarrhea
- Increased nutrient needs due to fever or high HIV load

Many infants, children, and adolescents with HIV do not gain weight or grow normally[11,12] and may experience loss of lean body mass (muscle).[13] However, HAART can promote improved growth.[14,15]

Eating healthy foods to promote weight gain and growth is especially important for infants, children, and adolescents with HIV. Not only are these infants, children, and adolescents growing, but they are also coping with the adverse impact of HIV on their bodies and with the side effects of treatment. Good nutrition helps prevent infections related to weight loss or wasting and is also vital for optimal growth and development, which may be more difficult for infants, children, and adolescents with HIV to achieve. Eating and drinking extra food to increase calorie and protein intake may be particularly important after recovering from an acute opportunistic infection.[13]

Children and adolescents with HIV are at higher risk than their counterparts who do not have HIV for developing low bone-mineral density, which can result in osteoporosis and increased risk for bone fractures. Both HIV and certain HIV medications may cause low bone-mineral density.[16] To promote optimal bone health, children and adolescents should consume adequate calcium and vitamin D and should avoid smoking and alcohol consumption.[15]

In recent years, the number of older children and adolescents with HIV who are overweight has increased. There seems to be a higher prevalence of overweight among adolescents with HIV who did not acquire HIV perinatally.[17]

Lipodystrophy syndrome is a group of symptoms that may include redistribution of body fat (loss of fat in the face, arms, legs, and buttocks and accumulation of fat around the abdomen and behind the neck), high blood levels of cholesterol and triglycerides, and difficulty controlling blood glucose (sugar) levels.[18] In children and adolescents, lipodystrophy syndrome is associated with HAART, especially when protease inhibitors are used and viral loads are well controlled.[18–20] Changes in diet and antiretroviral agents along with medically supervised physical activity programs may help to reverse some of these side effects.

ASSESSMENT

A registered dietitian should complete a baseline nutrition assessment as soon as possible after an infant, child, or adolescent is diagnosed with HIV in order to initiate appropriate interventions aimed at the prevention or treatment of malnutrition and compromised growth. Another nutrition assessment should then be conducted every 3 months.[10] More frequent assessments are warranted when clinical symptoms or growth abnormalities are present.

A nutrition assessment includes comparing the growth of the infant, child, or adolescent to a reference population or to growth standards by plotting measurements on a clinical growth chart.[21] Measurements include head circumference for age (birth–36 months), weight for age, and length for age (birth–36 months) or stature for age (2–20 years). Evaluating weight for length (birth–36 months) and body mass index for age (2–20 years) is another important component of the nutrition assessment. Weight and length or stature growth velocity should be monitored. A slowed growth rate indicates the need to evaluate for nutrition intervention. Body composition can be evaluated using skinfold measurements and circumferences or bioelectrical impedance analysis. Changes in body composition, such as decreased muscle mass or changes in fat distribution, can be detected by these methods and may signify the need for nutrition intervention.

The biochemical markers that should be standard components of evaluation are albumin, prealbumin, hemoglobin and hematocrit, iron studies, glucose, cholesterol, and triglycerides. If micronutrient deficiencies are suspected, specific blood assays should be conducted. For example, vitamin D levels should be monitored when there is a risk for low bone mineral density.[16]

The nutrition intake of an infant, child, or adolescent with HIV should be assessed using 24-hour recall, food records, food-frequency questionnaires, or a combination of these. Signs of inadequate nutrition intake or excessive nutrient losses through diarrhea or vomiting are important to investigate, and nutrition intervention should be incorporated in the infant, child, or adolescent's nutritional care plan.

Physical activity, use of herbs or dietary supplements, and health information should be evaluated as well.[10] Benefits of physical activity include maintenance of lean body mass and healthy weight. Physical activity should be evaluated for its level and intensity, which should be tolerated by the child or adolescent, approved by the health care team, and balanced with energy intake. Reviewing herbs and dietary supplements is important for identifying interactions with medications and potentially harmful side effects. The infant, child, or adolescent's medical history should be reviewed for food allergies and health conditions other than HIV that may require specialized nutrition intervention.

ANTICIPATORY GUIDANCE

Following are tips to help ensure optimal nutrition for infants, children, or adolescents with HIV:

- Consult a registered dietitian for help in designing a healthy, well-balanced eating plan that contains a variety of nutritious foods.
- Serve 3 healthy meals plus 2 to 3 healthy snacks per day. Emphasize snacking, especially if weight loss or nutrient deficiencies are apparent.
- Offer healthy foods high in protein. Meat products (eg, beef, fish, poultry), eggs, milk, milk products (eg, cheese, yogurt) are good sources of protein. Soy products are also good sources of high biological-value protein and can be used to augment or substitute meat, milk, and milk products. Beans, seeds, nuts, and nut butters are rich in protein as well and can be used to supplement other protein sources.

- Encourage the consumption of plenty of fluids.
- Minimize the consumption of foods containing simple carbohydrates (eg, candy, soda, juice).
- Practice safe food-handling techniques. (See Tool H: Basics for Handling Food Safely.)
- Encourage physical activity on most days of the week.

Nausea

- Offer small meals every 2 hours and fluids, as tolerated, every 1 to 2 hours.
- Serve plain, low-fat foods (eg, rice or pasta, potatoes, cooked or canned fruits and vegetables, baked chicken or turkey, sherbet, toast, crackers, cereal).
- Serve fluids before meals, because they can increase the feeling of fullness if given before or with meals. Try cool or slightly chilled fluids.
- Avoid carbonated beverages.
- Avoid serving foods with strong flavors, odors, or spices and foods that are high in fat or very sweet.

Diarrhea

- Offer small meals every 2 hours and fluids, especially diluted fruit juices, as tolerated every 1 to 2 hours.
- Serve simply prepared foods that are low in insoluble fiber (eg, plain rice or pasta, cooked cereal, soft-cooked eggs, bananas, canned fruit packed in juice, baked chicken or turkey, white bread, saltines, toast).
- Avoid serving milk and milk products if diarrhea worsens, as lactose intolerance may be a causative factor.
- Offer foods that are high in sodium (eg, bouillon, broth) and potassium (eg, bananas, peaches, apricots, potatoes) to replace lost minerals.
- Avoid serving spicy foods and foods that are high in fat.
- Do not offer foods that contain caffeine (eg, chocolate, coffee, tea, colas).

Weight Loss

- Offer foods high in calories (eg, peanut butter, nuts, avocado, hummus, cheese, yogurt, ice cream, pudding, custard, whole milk, half and half, macaroni and cheese, dried fruit, cooked cereal made with whole milk).
- Increase the caloric content of foods.
  - Use sweetened condensed milk or evaporated milk in pudding, milkshakes, and baked foods.
  - Add powdered milk to cooked cereal, mashed potatoes, soup, and pudding.
  - Prepare milkshakes made with whole milk, fresh or frozen fruits or peanut butter, and ice cream.
  - Add cheese, butter, or margarine to foods.
  - Add extra oil to foods (eg, add olive oil to pasta).
- Consider recommending an oral nutrition supplement.
- If weight loss continues, enteral or parenteral nutrition support may be indicated.

Overweight

- Avoid serving foods high in fat and sugar and low in vitamins, minerals, and fiber (eg, soda, candy, potato chips, french fries). (See the Obesity chapter.)
- Provide lean protein sources (eg, chicken breasts, fish, beans, low-fat milk and milk products) and plenty of fruits, vegetables, and whole grains (eg, whole-wheat bread and pasta, brown rice).

Difficulty Taking Medications

- Take medications as directed. Some medications should be taken with meals high in fat, others with meals low in fat, and still others with no food at all.
- Refrigerate liquid medications to minimize their odor and taste.
- Offer ice chips or a frozen snack (eg, ice pops) to dull the child's or adolescent's taste buds before giving medication.
- Use foods to minimize the odor and taste of medication. Check with the infant's, child's, or adolescent's medical provider to ensure that the foods will not compromise the effectiveness of the medication.
  - Add liquid medications to thick foods (eg, peanut butter, pudding).
  - Add medications (that can be dissolved) to soft foods (eg, applesauce, milk, ice cream).

Vitamin and Mineral Deficiency

Infants, children, and adolescents with HIV may not be consuming adequate amounts of vitamins and minerals because of poor appetite, nutritional losses as a result of vomiting or diarrhea, or increased demands on the body to fight infection.

- Give a multivitamin and mineral supplement in liquid or pill form to children and adolescents ages 1 or older with HIV. The supplement should provide amounts at or near the Dietary Reference Intake.[10]

Low Bone Density

- Offer foods naturally rich in calcium (eg, milk, yogurt, cheese) and those fortified with calcium and vitamin D (eg, fortified orange juice, tofu, soy milk).
- Increase the calcium content of foods.
  - Add powdered milk to cooked cereal, mashed potatoes, soup, and pudding.
  - Use yogurt as a substitute for sour cream or mayonnaise in recipes.
- Avoid alcohol consumption.

High Cholesterol and Triglycerides and Poor Glucose Control

- Limit dietary saturated fats (eg, fats in animal and milk and milk products) and trans fats (eg, may be present in commercially fried foods and baked goods), and replace them with healthy fats (eg, fats in nuts, nut butters, avocado, hummus, olive and canola oils, salmon, tuna fish).
- Avoid overconsumption of carbohydrates. This can be accomplished by limiting concentrated sweets (eg, candy, soda, juice), which are poor sources of nutrients, and by avoiding large portion sizes of other foods that contain carbohydrates (eg, bread, pasta, rice, potatoes, cereal, fruits, vegetables). Instead of eating large amounts of carbohydrates at a time, spread out carbohydrate consumption evenly throughout the day.
- Increase fiber intake by eating vegetables, whole-grain bread and cereal, oatmeal, beans, and fruits.

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Hyperlipidemia

Hyperlipidemia or hyperlipoproteinemia typically refers to any elevation of blood lipid levels (eg, total cholesterol, triglycerides, or lipoproteins).[1] Although terms such as hypercholesterolemia are often used interchangeably with hyperlipidemia, there are subtle differences. Hypercholesterolemia refers to elevated blood cholesterol. Dyslipoproteinemia or dyslipidemia describes abnormal levels of blood lipoproteins (eg, low levels of high-density lipoprotein [HDL], elevated low-density [LDL], or elevated very-low-density lipoprotein). Table 1 lists the range of acceptable, borderline, and high total cholesterol; LDL cholesterol; and triglyceride levels for children and adolescents at risk for atherosclerosis (hardening of the arteries). Additionally, an HDL cholesterol less than 35 mg/dL is considered abnormal for children and adolescents.[2]

TABLE 1. CLASSIFICATION OF CHOLESTEROL LEVELS IN CHILDREN AND ADOLESCENTS[a]

	Total Cholesterol, mg/dL	LDL Cholesterol, mg/dL	Triglycerides, mg/dL
Acceptable	<170	<110	
Borderline	170–199	110–129	
High	≥200	≥130	>150

[a]Sources: National Institutes of Health,[1] Kavey et al,[2] and Gidding et al.[3]

SIGNIFICANCE

Blood cholesterol levels have decreased among adolescents over the past 2 decades; however, approximately 10.8% of adolescents (ages 12–19) have a total cholesterol level greater than 200 mg/dL.[4] In adolescents (ages 12–19), 23.2% had elevated triglycerides and 23.4% had low HDL cholesterol.[5]

There are age, gender, racial/ethnic, and pubertal differences in blood lipid levels among children and adolescents. The American Heart Association (AHA) has determined age- and gender-specific cutpoints for total cholesterol, LDL cholesterol, HDL cholesterol, and triglycerides in adolescents (ages 12–20). However, longitudinal studies are needed to validate the cutpoints before they can be used instead of the National Cholesterol Education Program (NCEP) criteria.[6]

In adults, elevated total cholesterol levels are strongly associated with atherosclerosis and death from coronary heart disease (CHD).[7] The process of atherosclerosis begins in childhood, with the appearance of fatty streaks in the arteries. Dietary interventions can lower total and LDL cholesterol levels (saturated- and trans-fat reduction), as well as triglycerides (simple sugar reduction) and are considered the initial therapy for hyperlipidemia. Physical activity can increase HDL cholesterol.[1]

PREVENTION

Strategies for the prevention of atherosclerosis include choosing foods that meet nutrition requirements, supporting an active lifestyle, and promoting health as recommended in the *Dietary Guidelines for Americans*.[8]

The following recommendations have been issued for the prevention of atherosclerosis among children and adolescents.

DIETARY RECOMMENDATIONS FOR CHILDREN: BIRTH THROUGH AGE 2

- Children should not have their fat or dietary cholesterol intake restricted because of the high energy needs during this time of rapid growth and development.[9,10]
- Reduced fat milk may be considered for children older than 12 months who are at risk for obesity, or have a family history of cardiovascular disease, dyslipidemia, or obesity.[11]

DIETARY RECOMMENDATIONS FOR CHILDREN AND ADOLESCENTS: AGE 2 AND OLDER

- At age 2, children gradually need to begin eating fewer high-fat foods, so that by age 5, they receive no more than 30% of their calories from fat.[10]
- Saturated fat should be less than 10% of the total calories.[2,10,12]
- Polyunsaturated fatty acids should account for up to 10% of total calories.[12]
- Limit trans fatty acid intake to less than 1% of total calories.[2,11]
- Over several days, total fat should average not more than 30% but not less than 20% of total calories.[10,12]
- Dietary cholesterol should be no more than 300 mg per day.[2,10,12]
- Consume a variety of foods to provide adequate calories for growth, development, and maintenance of a desirable weight.[2,12]
- Salt should be less than 6 g per day.[2]
- Limit sugar intake.[2]

OTHER NON-DIETARY RECOMMENDATIONS FOR CHILDREN AND ADOLESCENTS

- Participate in 60 minutes of moderate to vigorous fun physical activity daily.[2]
- Limit sedentary activity, including screen time, to 2 hours or less each day.[2]
- Avoid tobacco use, cease smoking if one currently smokes, and avoid environmental tobacco exposure.[2]

SCREENING

Early identification and treatment of children and adolescents with elevated lipid levels may reduce their risk of developing premature CHD. The most significant risk factor for hyperlipidemia is family history of premature cardiovascular disease and/or high blood cholesterol. Children and adolescents older than 2 years who meet any of the following criteria should have a fasting lipid profile completed to assess their individual risk. However, values obtained from the fasting lipid profile during puberty may reflect a lower LDL cholesterol often seen during pubertal maturation. Lipid values around age 10 years may be most similar to the ultimate adult values.[11] If the lipid values are within the normal range, the child or adolescent should be rescreened every 2 to 3 years.[11] Risk factors include

- A parent or grandparent (≤55 years of age in men and ≤65 years of age in women) who has been diagnosed with coronary atherosclerosis (on the basis of a coronary arteriography), including those who have undergone balloon angioplasty or coronary artery bypass surgery[2,10–12]
- A parent or grandparent (≤55 years of age in men and ≤65 years of age in women) with documented myocardial infarction, angina pectoris, peripheral vascular disease, cerebrovascular disease, or sudden cardiac death[2,9–12]
- Children and adolescents whose family history cannot be reliably obtained—particularly those with other risk factors[9,10,11,13]
- Overweight or obese[11,14]
- Hypertension[11]
- Cigarette smoking[11]
- Diabetes mellitus[11]

Pharmacologic therapy should be considered for children and adolescents age 8 and older, after 6 to 12 months of dietary changes have been attempted; with LDL cholesterol 190 mg/dL or greater with no other cardiovascular disease risk factors, for those with LDL cholesterol greater than 160 mg/dL with either 2 or more other risk factors and who do not reach treatment goals with lifestyle changes or a family history of premature cardiovascular disease, or LDL cholesterol greater than 130 mg/dL with diabetes mellitus.[12,14,15] Initial therapy recommendations in children by the NCEP guidelines call for the use of bile acid-binding resins. More commonly statins have been used due to poor compliance with bile acid-binding resins because they may cause gastrointestinal distress.[14] The American Academy of Pediatrics recommends an initial goal of lowering LDL cholesterol to less than 160 mg/dL; however, depending on family history and/or other risk factors, goals of 130 mg/dL or 110 mg/dL may be more appropriate.[11] Currently there are no recommended cut-off triglyceride or HDL cholesterol levels for initiation of pharmacologic therapy in children.[14]

Other risk factors that contribute to early onset of CHD include the following: [10,16]

- Family history of premature CHD, cerebrovascular disease, or occlusive peripheral vascular disease
- Cigarette smoking
- Elevated blood pressure
- Low HDL cholesterol concentrations (<35 mg/dL)[2]
- Overweight (85th–94th percentile), obese (95th–98th percentile), severely obese (≥99th percentile)[17]
- Diabetes mellitus
- Physical inactivity

Additionally, the AHA has identified the following conditions in children and adolescents as indicative of increased risk for cardiovascular disease and requiring treatment at lower levels than other children.[18]

- Tier 1 (high risk): homozygous familial hypercholesterolemia, type 1 diabetes mellitus, chronic kidney disease, end-stage renal disease, post-orthostatic heart transplantation, Kawasaki disease with current coronary aneurysms
- Tier 2 (moderate risk): heterozygous familial hypercholesterolemia, Kawasaki disease with regressed coronary aneurysms, type 2 diabetes mellitus, chronic inflammatory disease
- Tier 3 (at-risk): post-cancer treatment survivors, congenital heart disease, Kawasaki disease without detected coronary involvement

NUTRITION SCREENING

- Interview the child or adolescent and parents to assess food purchasing and preparation habits as well as eating patterns. Provide nutrition counseling.[19,20]
- Ask the child or adolescent to complete a 3-day food record to supplement the dietary interview. (If the child is <10, the parent should complete the food record.)[19,20]

MONITORING

Children and adolescents with hyperlipidemia need to have their blood cholesterol, eating behaviors, and other risk factors monitored regularly. Children and adolescents with normal lipid values should be rescreened within 3 to 5 years.[11] If blood lipid levels have not improved or dietary goals have not been achieved, more intensive counseling may be required. With familial lipid disorders, blood lipid levels may not improve sufficiently, even with excellent adherence to a regimen.[11] This may be an appropriate time for referral to a lipid center and/or consideration of drug therapy. Even with drug therapy, dietary changes are still an important therapy component.[11]

ANTICIPATORY GUIDANCE

Following are the major components of nutrition anticipatory guidance for children and adolescents with hyperlipidemia.

- Seek support from the child's or adolescent's family.
- Educate children and adolescents and their families to follow a diet containing less than 7% of total calories from saturated fat and less than 200 mg of dietary cholesterol per day.[3,11]
- Educate children or adolescents and their families who are overweight or obese about weight management, including changes to diet and physical activity.[11]

- Ensure the nutritional adequacy of the child's or adolescent's diet.
- Teach skills for appropriately selecting and preparing food.
- Help the child or adolescent and the family plan ahead for special occasions and provide flexibility in food choices.
- Encourage the reduction of other CHD risk factors, such as tobacco or anabolic steroid use.
- Encourage regular physical activity and sound approaches to weight management.
- Discuss the incorporation of foods containing plant stanols and sterols into a healthy diet.[12]
- Encourage the consumption of fiber-rich foods, especially those containing soluble fiber.[11]
- Table 2 provides the daily estimated calories and recommended servings for food groups by age and gender.

REFERRAL

Referral to a specialized lipid center should be considered for children and adolescents with a significant family history of premature heart disease or familial lipid disorders. Comprehensive nutrition counseling for the family is needed to help the child or adolescent adhere to the diet. Diet restrictions should be determined with a registered dietitian.[11,18]

TABLE 2. ESTIMATED CALORIES AND RECOMMENDED SERVINGS FOR MILK/MILK PRODUCTS, LEAN MEATS/BEANS, FRUITS, VEGETABLES, AND GRAINS BY AGE AND GENDER[a,b]

	1 Year	2–3 Years	4–8 Years	9–13 Years	14–18 Years
Calories[c]	900 kcal	1,000 kcal			
Female			1,200 kcal	1,600 kcal	1,800 kcal
Male			1,400 kcal	1,800 kcal	2,200 kcal
Fat	30%–40% kcal	30%–35% kcal	25%–35% kcal	25%–35% kcal	25%–35% kcal
Milk/milk products[d]	2 cups[e]	2 cups	2 cups	3 cups	3 cups
Lean meats/beans	1½ oz	2 oz		5 oz	
Female			3 oz		5 oz
Male			4 oz		6 oz
Fruits[f]	1 cup	1 cup	1½ cup	1½ cup	
Female					1½ cup
Male					2 cup
Vegetables[f]	¾ cup	1 cup			
Female			1 cup	2 cup	2½ cup
Male			1½ cup	2½ cup	3 cup
Grains[g]	2 oz	3 oz			
Female			4 oz	5 oz	6 oz
Male			5 oz	6 oz	7 oz

[a]Sources: Gidding et al[3] and US Department of Health and Human Services.[8]
[b]Calorie estimates are based on sedentary lifestyle. Increased physical activity will require additional calories (up to 200 kcal/day if moderately physically active and 200 to 400 kcal/day if very physically active).
[c]For children ages 2 and older; adapted from the *Dietary Guidelines for Americans*.[8] Nutrient and energy contributions from each group are calculated according to the nutrient-dense forms of food in each group (eg, lean meats/beans, fat-free milk).
[d]Milk listed is fat-free milk (except for 1-year-old children). If 1%, 2%, or whole milk is substituted, use, for each cup, 19, 39, or 63 kcal, respectively, of discretionary calories and 2.6, 5.1, or 9.0 g of total fat, of which 1.3, 2.6, or 4.6 g are saturated fat.
[e]For 1-year-old children, 2% milk is included. If 2 cups of whole milk are substituted, 48 kcal of discretionary calories will be used.
[f]Serving sizes are ¼ cup for 1 year of age, ⅓ cup for 2 to 3 years of age, and ½ cup for ≥4 years of age. A variety of vegetables should be selected from each subgroup over the week.
[g]Half of all grains should be whole grains.

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Hypertension

In children and adolescents, primary or essential hypertension is diagnosed when persistently elevated blood pressure cannot be explained by any underlying organic cause. According to the National High Blood Pressure Education Program Working Group on High Blood Pressure in Children and Adolescents, children and adolescents 1 to 17 years of age are considered hypertensive if their average systolic and/or diastolic blood pressure readings are at or above the 95th percentile (based on age, sex, and height) on at least 3 separate occasions. Definitions of normal blood pressure, pre-hypertension, and hypertension are as follows[1]:

- Normal blood pressure: less than 90th percentile
- Pre-hypertension: 90th percentile to the 94th percentile or if blood pressure exceeds 120/80 mm Hg even if blood pressure is less than 90th percentile to the 94th percentile
- Hypertension: 95th percentile or greater (on 3 separate occasions)
- Stage 1 hypertension: 95th percentile to the 99th percentile plus 5 mm Hg
- Stage 2 hypertension: greater than the 99th percentile plus 5 mm Hg

Children and adolescents with frequent blood pressure readings between the 90th percentile and the 94th percentiles for their age, sex, and height or greater than 120/80 mm Hg (even if <90th percentile) are defined as having pre-hypertension and are at risk for developing hypertension. These children and adolescents should be followed regularly for early detection of further elevation in blood pressure. Tables 1 and 2 present the blood pressure standards for the 50th, 90th, 95th, and 99th percentiles for males and females ages 1 to 17 years, by age and percentile of height.[1]

For adolescents ages 18 and older, the severity of elevated blood pressure, when observed on 2 or more occasions, is evaluated on the basis of the adult criteria in Table 3.[2]

SIGNIFICANCE

Primary hypertension is an independent risk factor for cardiovascular disease. Familial patterns for primary hypertension have established that high blood pressure has its origins in childhood and adolescence. If left untreated, high blood pressure generally will persist into adulthood. Primary hypertension is now considered the most common form of mild-to-moderate hypertension among adolescents, particularly those who are overweight and/or have a family history of high blood pressure.

TABLE 1. BLOOD PRESSURE LEVELS FOR BOYS BY AGE AND HEIGHT PERCENTILE[a]

Blood Pressure Levels for Boys by Age and Height Percentile

Age (Year)	BP Percentile ↓	Systolic BP (mmHg) ← Percentile of Height →							Diastolic BP (mmHg) ← Percentile of Height →						
		5th	10th	25th	50th	75th	90th	95th	5th	10th	25th	50th	75th	90th	95th
1	50th	80	81	83	85	87	88	89	34	35	36	37	38	39	39
	90th	94	95	97	99	100	102	103	49	50	51	52	53	53	54
	95th	98	99	101	103	104	106	106	54	54	55	56	57	58	58
	99th	105	106	108	110	112	113	114	61	62	63	64	65	66	66
2	50th	84	85	87	88	90	92	92	39	40	41	42	43	44	44
	90th	97	99	100	102	104	105	106	54	55	56	57	58	58	59
	95th	101	102	104	106	108	109	110	59	59	60	61	62	63	63
	99th	109	110	111	113	115	117	117	66	67	68	69	70	71	71
3	50th	86	87	89	91	93	94	95	44	44	45	46	47	48	48
	90th	100	101	103	105	107	108	109	59	59	60	61	62	63	63
	95th	104	105	107	109	110	112	113	63	63	64	65	66	67	67
	99th	111	112	114	116	118	119	120	71	71	72	73	74	75	75
4	50th	88	89	91	93	95	96	97	47	48	49	50	51	51	52
	90th	102	103	105	107	109	110	111	62	63	64	65	66	66	67
	95th	106	107	109	111	112	114	115	66	67	68	69	70	71	71
	99th	113	114	116	118	120	121	122	74	75	76	77	78	78	79
5	50th	90	91	93	95	96	98	98	50	51	52	53	54	55	55
	90th	104	105	106	108	110	111	112	65	66	67	68	69	69	70
	95th	108	109	110	112	114	115	116	69	70	71	72	73	74	74
	99th	115	116	118	120	121	123	123	77	78	79	80	81	81	82
6	50th	91	92	94	96	98	99	100	53	53	54	55	56	57	57
	90th	105	106	108	110	111	113	113	68	68	69	70	71	72	72
	95th	109	110	112	114	115	117	117	72	72	73	74	75	76	76
	99th	116	117	119	121	123	124	125	80	80	81	82	83	84	84
7	50th	92	94	95	97	99	100	101	55	55	56	57	58	59	59
	90th	106	107	109	111	113	114	115	70	70	71	72	73	74	74
	95th	110	111	113	115	117	118	119	74	74	75	76	77	78	78
	99th	117	118	120	122	124	125	126	82	82	83	84	85	86	86
8	50th	94	95	97	99	100	102	102	56	57	58	59	60	60	61
	90th	107	109	110	112	114	115	116	71	72	72	73	74	75	76
	95th	111	112	114	116	118	119	120	75	76	77	78	79	79	80
	99th	119	120	122	123	125	127	127	83	84	85	86	87	87	88
9	50th	95	96	98	100	102	103	104	57	58	59	60	61	61	62
	90th	109	110	112	114	115	117	118	72	73	74	75	76	76	77
	95th	113	114	116	118	119	121	121	76	77	78	79	80	81	81
	99th	120	121	123	125	127	128	129	84	85	86	87	88	88	89
10	50th	97	98	100	102	103	105	106	58	59	60	61	61	62	63
	90th	111	112	114	115	117	119	119	73	73	74	75	76	77	78
	95th	115	116	117	119	121	122	123	77	78	79	80	81	81	82
	99th	122	123	125	127	128	130	130	85	86	86	88	88	89	90

[a]Reprinted from: National High Blood Pressure Education Program Working Group on High Blood Pressure in Children and Adolescents.[1]

TABLE 1. BLOOD PRESSURE LEVELS FOR BOYS BY AGE AND HEIGHT PERCENTILE,[a] CONTINUED

Blood Pressure Levels for Boys by Age and Height Percentile (Continued)

Age (Year)	BP Percentile ↓	Systolic BP (mmHg) ← Percentile of Height →							Diastolic BP (mmHg) ← Percentile of Height →						
		5th	10th	25th	50th	75th	90th	95th	5th	10th	25th	50th	75th	90th	95th
11	50th	99	100	102	104	105	107	107	59	59	60	61	62	63	63
	90th	113	114	115	117	119	120	121	74	74	75	76	77	78	78
	95th	117	118	119	121	123	124	125	78	78	79	80	81	82	82
	99th	124	125	127	129	130	132	132	86	86	87	88	89	90	90
12	50th	101	102	104	106	108	109	110	59	60	61	62	63	63	64
	90th	115	116	118	120	121	123	123	74	75	75	76	77	78	79
	95th	119	120	122	123	125	127	127	78	79	80	81	82	82	83
	99th	126	127	129	131	133	134	135	86	87	88	89	90	90	91
13	50th	104	105	106	108	110	111	112	60	60	61	62	63	64	64
	90th	117	118	120	122	124	125	126	75	75	76	77	78	79	79
	95th	121	122	124	126	128	129	130	79	79	80	81	82	83	83
	99th	128	130	131	133	135	136	137	87	87	88	89	90	91	91
14	50th	106	107	109	111	113	114	115	60	61	62	63	64	65	65
	90th	120	121	123	125	126	128	128	75	76	77	78	79	79	80
	95th	124	125	127	128	130	132	132	80	80	81	82	83	84	84
	99th	131	132	134	136	138	139	140	87	88	89	90	91	92	92
15	50th	109	110	112	113	115	117	117	61	62	63	64	65	66	66
	90th	122	124	125	127	129	130	131	76	77	78	79	80	80	81
	95th	126	127	129	131	133	134	135	81	81	82	83	84	85	85
	99th	134	135	136	138	140	142	142	88	89	90	91	92	93	93
16	50th	111	112	114	116	118	119	120	63	63	64	65	66	67	67
	90th	125	126	128	130	131	133	134	78	78	79	80	81	82	82
	95th	129	130	132	134	135	137	137	82	83	83	84	85	86	87
	99th	136	137	139	141	143	144	145	90	90	91	92	93	94	94
17	50th	114	115	116	118	120	121	122	65	66	66	67	68	69	70
	90th	127	128	130	132	134	135	136	80	80	81	82	83	84	84
	95th	131	132	134	136	138	139	140	84	85	86	87	87	88	89
	99th	139	140	141	143	145	146	147	92	93	93	94	95	96	97

[a]Reprinted from: National High Blood Pressure Education Program Working Group on High Blood Pressure in Children and Adolescents.[1]

TABLE 2. BLOOD PRESSURE LEVELS FOR GIRLS BY AGE AND HEIGHT PERCENTILE[a]

Blood Pressure Levels for Girls by Age and Height Percentile

Age (Year)	BP Percentile ↓	Systolic BP (mmHg) ← Percentile of Height →							Diastolic BP (mmHg) ← Percentile of Height →						
		5th	10th	25th	50th	75th	90th	95th	5th	10th	25th	50th	75th	90th	95th
1	50th	83	84	85	86	88	89	90	38	39	39	40	41	41	42
	90th	97	97	98	100	101	102	103	52	53	53	54	55	55	56
	95th	100	101	102	104	105	106	107	56	57	57	58	59	59	60
	99th	108	108	109	111	112	113	114	64	64	65	65	66	67	67
2	50th	85	85	87	88	89	91	91	43	44	44	45	46	46	47
	90th	98	99	100	101	103	104	105	57	58	58	59	60	61	61
	95th	102	103	104	105	107	108	109	61	62	62	63	64	65	65
	99th	109	110	111	112	114	115	116	69	69	70	70	71	72	72
3	50th	86	87	88	89	91	92	93	47	48	48	49	50	50	51
	90th	100	100	102	103	104	106	106	61	62	62	63	64	64	65
	95th	104	104	105	107	108	109	110	65	66	66	67	68	68	69
	99th	111	111	113	114	115	116	117	73	73	74	74	75	76	76
4	50th	88	88	90	91	92	94	94	50	50	51	52	52	53	54
	90th	101	102	103	104	106	107	108	64	64	65	66	67	67	68
	95th	105	106	107	108	110	111	112	68	68	69	70	71	71	72
	99th	112	113	114	115	117	118	119	76	76	76	77	78	79	79
5	50th	89	90	91	93	94	95	96	52	53	53	54	55	55	56
	90th	103	103	105	106	107	109	109	66	67	67	68	69	69	70
	95th	107	107	108	110	111	112	113	70	71	71	72	73	73	74
	99th	114	114	116	117	118	120	120	78	78	79	79	80	81	81
6	50th	91	92	93	94	96	97	98	54	54	55	56	56	57	58
	90th	104	105	106	108	109	110	111	68	68	69	70	70	71	72
	95th	108	109	110	111	113	114	115	72	72	73	74	74	75	76
	99th	115	116	117	119	120	121	122	80	80	80	81	82	83	83
7	50th	93	93	95	96	97	99	99	55	56	56	57	58	58	59
	90th	106	107	108	109	111	112	113	69	70	70	71	72	72	73
	95th	110	111	112	113	115	116	116	73	74	74	75	76	76	77
	99th	117	118	119	120	122	123	124	81	81	82	82	83	84	84
8	50th	95	95	96	98	99	100	101	57	57	57	58	59	60	60
	90th	108	109	110	111	113	114	114	71	71	71	72	73	74	74
	95th	112	112	114	115	116	118	118	75	75	75	76	77	78	78
	99th	119	120	121	122	123	125	125	82	82	83	83	84	85	86
9	50th	96	97	98	100	101	102	103	58	58	58	59	60	61	61
	90th	110	110	112	113	114	116	116	72	72	72	73	74	75	75
	95th	114	114	115	117	118	119	120	76	76	76	77	78	79	79
	99th	121	121	123	124	125	127	127	83	83	84	84	85	86	87
10	50th	98	99	100	102	103	104	105	59	59	59	60	61	62	62
	90th	112	112	114	115	116	118	118	73	73	73	74	75	76	76
	95th	116	116	117	119	120	121	122	77	77	77	78	79	80	80
	99th	123	123	125	126	127	129	129	84	84	85	86	86	87	88

[a]Reprinted from: National High Blood Pressure Education Program Working Group on High Blood Pressure in Children and Adolescents.[1]

TABLE 2. BLOOD PRESSURE LEVELS FOR GIRLS BY AGE AND HEIGHT PERCENTILE,[a] CONTINUED

Blood Pressure Levels for Girls by Age and Height Percentile (Continued)

Age (Year)	BP Percentile ↓	Systolic BP (mmHg) ← Percentile of Height →							Diastolic BP (mmHg) ← Percentile of Height →						
		5th	10th	25th	50th	75th	90th	95th	5th	10th	25th	50th	75th	90th	95th
11	50th	100	101	102	103	105	106	107	60	60	60	61	62	63	63
	90th	114	114	116	117	118	119	120	74	74	74	75	76	77	77
	95th	118	118	119	121	122	123	124	78	78	78	79	80	81	81
	99th	125	125	126	128	129	130	131	85	85	86	87	87	88	89
12	50th	102	103	104	105	107	108	109	61	61	61	62	63	64	64
	90th	116	116	117	119	120	121	122	75	75	75	76	77	78	78
	95th	119	120	121	123	124	125	126	79	79	79	80	81	82	82
	99th	127	127	128	130	131	132	133	86	86	87	88	88	89	90
13	50th	104	105	106	107	109	110	110	62	62	62	63	64	65	65
	90th	117	118	119	121	122	123	124	76	76	76	77	78	79	79
	95th	121	122	123	124	126	127	128	80	80	80	81	82	83	83
	99th	128	129	130	132	133	134	135	87	87	88	89	89	90	91
14	50th	106	106	107	109	110	111	112	63	63	63	64	65	66	66
	90th	119	120	121	122	124	125	125	77	77	77	78	79	80	80
	95th	123	123	125	126	127	129	129	81	81	81	82	83	84	84
	99th	130	131	132	133	135	136	136	88	88	89	90	90	91	92
15	50th	107	108	109	110	111	113	113	64	64	64	65	66	67	67
	90th	120	121	122	123	125	126	127	78	78	78	79	80	81	81
	95th	124	125	126	127	129	130	131	82	82	82	83	84	85	85
	99th	131	132	133	134	136	137	138	89	89	90	91	91	92	93
16	50th	108	108	110	111	112	114	114	64	64	65	66	66	67	68
	90th	121	122	123	124	126	127	128	78	78	79	80	81	81	82
	95th	125	126	127	128	130	131	132	82	82	83	84	85	85	86
	99th	132	133	134	135	137	138	139	90	90	90	91	92	93	93
17	50th	108	109	110	111	113	114	115	64	65	65	66	67	67	68
	90th	122	122	123	125	126	127	128	78	79	79	80	81	81	82
	95th	125	126	127	129	130	131	132	82	83	83	84	85	85	86
	99th	133	133	134	136	137	138	139	90	90	91	91	92	93	93

[a]Reprinted from: National High Blood Pressure Education Program Working Group on High Blood Pressure in Children and Adolescents.[1]

TABLE 3. CLASSIFICATION OF BLOOD PRESSURE FOR ADULTS[a]

Classification	SBP (mm Hg)		DBP (mm Hg)
Normal	<120	and	<80
Pre-hypertension	120–139	or	80–89
Stage 1 hypertension	140–159	or	90–99
Stage 2 hypertension	≥160	or	≥100

[a]From: Chobanian et al.[2]

SCREENING AND ASSESSMENT

BLOOD PRESSURE

Blood pressure screening is a universal recommendation at periodic physical examinations beginning at age 3 years (using the method described in *The Fourth Report on Diagnosis, Evaluation, and Treatment of High Blood Pressure in Children and Adolescents*[1]). Screening should be repeated at subsequent health supervision visits. Correct measurement of blood pressure in children requires a cuff sized appropriately for the child's upper right arm. The right arm is preferred for consistency and for comparison with the standardized tables.[1] When an elevated systolic or diastolic blood pressure reading is first obtained, 2 or more measurements at a comparable level, taken consecutively over weeks or months, must be obtained before a diagnosis of hypertension is confirmed. When standardized techniques for measuring blood pressure in children and adolescents are followed, an estimated 1% to 3% will be found to have persistent hypertension. This prevalence is higher among children and adolescents who are overweight or obese. Children younger than age 3 with certain risk factors for elevated blood pressure are selectively screened at all health supervision visits.

OBESITY

Obesity and an excess distribution of fat in the midsection of the body ("central obesity") are recognized as significant risk factors in the development of primary hypertension. Obesity in children and adolescents can be assessed through body mass index (BMI) for age and gender percentiles. Body mass index is a weight-stature index (BMI = kg/m^2) correlated with subcutaneous and total body fat in children and adolescents. A BMI between the 85th percentile and 94th percentile is considered overweight. A BMI at the 95th percentile or greater is considered obese.[3] (See the Obesity chapter.)

BLOOD LIPIDS

Children and adolescents who are hypertensive may also have abnormal blood lipid levels, which increase their risk of developing cardiovascular disease as adults. It is advisable to obtain fasting blood lipid levels for children and adolescents with primary hypertension. (See the Hyperlipidemia chapter.)

DIETARY FACTORS

Dietary modifications that reduce sodium intake and encourage a healthy weight can help lower blood pressure.[4,5] Children and adolescents who are hypertensive and also have elevated blood lipid levels should be advised to modify their intake of total fat, saturated fat, and cholesterol. Although there is some evidence that an increased intake of calcium, potassium, and magnesium and a decreased intake of caffeine may lower blood pressure, the findings are inconclusive.

The goals of dietary screening and assessment are as follows:

- Evaluate children's and adolescents' diets for nutritional adequacy, based on the dietary guidelines in *MyPyramid*,[6] with particular emphasis on including low-fat milk and other low-fat dairy products, fruits, vegetables, and whole-grain breads and cereals.
- Identify regularly or frequently eaten foods that are high in sodium and/or fat, and suggest strategies for modifying the diet.
- Identify the family member(s) with the primary responsibility for purchasing food and preparing meals to ensure their involvement in counseling sessions.

PHYSICAL ACTIVITY

Children and adolescents who are physically fit have lower blood pressure levels than those who are not physically active, regardless of whether they are overweight. Children and adolescents who are hypertensive can improve their blood pressure level by participating in more aerobic physical activity on a regular basis. Children and adolescents with primary hypertension

typically can participate in sports and strenuous physical activity without restrictions, except for intense isometric exercise (eg, power lifting and some weight training, which can dramatically increase blood pressure). Young athletes with stage 2 hypertension are restricted from classes III A to III C sports as listed in the American Academy of Pediatrics policy statement "Medical Conditions Affecting Sports Participation" until blood pressure is adequately controlled.

Health professionals should screen for physical activity by asking questions about the type, frequency, and duration of physical activity performed alone, with family members, with peers, at school, and at community recreational facilities.

The goals of physical activity screening and assessment are as follows:

- Identify age-appropriate aerobic physical activities that are acceptable, attainable, and enjoyable for the child or adolescent to pursue regularly.
- Assess the child's or adolescent's level of physical inactivity (ie, sedentary behavior) in order to help families set appropriate limits (<2 hours per day) for activities such as watching television and videotapes, playing computer games, and spending time on the telephone.

TOBACCO

Nicotine exposure is associated with elevated blood pressure in adults. Thus it is essential for children and adolescents who are hypertensive to avoid any form of tobacco.

ANTICIPATORY GUIDANCE

Modifying dietary and physical activity behaviors is the initial strategy used in treating children and adolescents with primary hypertension. Children and adolescents who are overweight and have hypertension need effective weight-management strategies to improve their health. (See the Obesity chapter.) Introducing medication to lower blood pressure is considered only when the recommended changes do not significantly improve blood pressure after 6 to 12 months, unless stage 2 hypertension is present. In the setting of stage 2 hypertension, medication can be introduced along with dietary advice. If medication is prescribed, it is still important to adhere to the dietary and physical activity recommendations for primary hypertension.[4]

SODIUM AND SALT

The effect of dietary sodium on increased blood pressure is more pronounced in individuals who are "salt sensitive." Because there is no simple way to screen for salt sensitivity, children and adolescents with primary hypertension or those with high-normal blood pressure should be advised to follow a moderate sodium-restricted diet.[4,5]

Some dietary surveys have estimated sodium intake as high as 5,000 mg per day in children and adolescents. This intake far exceeds the estimated adequate daily intake for sodium needed to support growth and development during childhood and adolescence.[7] A moderate sodium-restricted diet for children and adolescents is considered to be 1,500 to 2,500 mg per day.

To achieve this moderate intake of sodium, the following measures are advised:

- Do not add salt to food at the table.
- During cooking, omit added salt and other seasonings with sodium.
- Reduce intake of processed or packaged foods high in salt and other sodium compounds, including salted snacks (eg, chips, crackers, pretzels, popcorn, nuts); processed cheeses; condiments (eg, ketchup, mustard); cured meats (eg, bacon, sausage, hot dogs, lunch meats); soups; and most commercially prepared soups and main-course foods that are frozen, boxed, or canned.
- Limit intake of foods from fast-food restaurants because some items contain one-third or more of the recommended daily sodium intake.

In adults, the DASH (Dietary Approach to Stop Hypertension) eating plan is effective in lowering blood pressure.[4] The DASH eating plan includes low-fat dairy products, fresh fruits and vegetables, and whole grains with avoidance of foods high in sugar, salt, and saturated fat. This

results in a diet that is relatively low in sodium, has appropriate calories, and is high in potassium. The DASH eating plan can also be effective in lowering blood pressure in adolescents with primary hypertension.[8] Many of the strategies to implement a lower intake of sodium can also be used in the implementation of the DASH eating plan.

PHYSICAL ACTIVITY

Providing anticipatory guidance to children and adolescents with hypertension (particularly those who are sedentary and overweight) to become more active can be difficult. Helping families make regular physical activity a priority, enlisting the involvement of school physical education instructors, and using community recreational facilities all encourage children and adolescents to make physical activity an enjoyable part of their life.

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Iron-Deficiency Anemia

Iron-deficiency anemia is identified by abnormally small red blood cells, with decreased hemoglobin or hematocrit and a reduced capacity to deliver oxygen to body cells and tissues.[1]

SIGNIFICANCE

Iron deficiency is the most prevalent form of nutrition deficiency in the United States. The risk of iron-deficiency anemia is highest during infancy and adolescence because of the increased iron requirements for rapid growth. In healthy full-term infants, iron stores are adequate until age 4 to 6 months. Iron requirements may exceed dietary iron intake after this time because of rapid rates of physical growth, placing older infants and young children at increased risk for iron deficiency. During the feeding transition from human milk or infant formula to solid foods, infants and young children may not consume adequate dietary sources of iron. Children from communities with a high concentration of families with low incomes and those with poor dietary habits are also at higher risk for iron deficiency. In addition, the onset of menarche and low dietary iron intake contribute to a higher risk for iron-deficiency anemia among adolescent females. Iron-deficiency anemia is more common among groups characterized by low income levels (compared with those characterized by higher income levels) and among African-American and Mexican-American children (compared with white children).[1]

Iron-deficiency anemia has been associated with developmental delays and behavioral disturbances in young children.[1,2] It has also been associated with impaired growth and development, fatigue, decreased resistance to infection, decreased physical performance, decreased levels of endurance, reduced attention span, decreased school performance, and increased susceptibility to lead poisoning.[1,2]

RISK FACTORS

Increased demand for iron, low intake of iron, and/or greater loss of iron from the body are associated with a higher risk for iron-deficiency anemia. The following conditions are associated with an increased risk for developing iron-deficiency anemia:

- Periods of rapid growth
- Preterm or low–birth weight birth
- Low dietary intake of meat, fish, poultry, fortified grains, or foods rich in ascorbic acid
- Macrobiotic and vegan diets

- Inappropriate consumption of cow's milk (infants should not consume cow's milk; children should not consume more than 24 oz of cow's milk per day)
- Use of non–iron-fortified infant formula for more than 2 months
- Exclusive breastfeeding after age 6 months without the addition of iron-fortified supplemental foods in the infant's diet
- Meal-skipping, frequent dieting
- Pregnancy, especially multiple and closely spaced pregnancies
- Participation in endurance sports (eg, long-distance running, swimming, cycling)
- Intensive physical training
- Recent blood loss, recent pregnancy, heavy/lengthy menstrual periods
- Chronic use of aspirin or nonsteroidal anti-inflammatory drugs (eg, ibuprofen)
- Parasitic infections

Although no guidelines exist for screening of overweight and obese children and adolescents, research indicates that a greater number of these children and adolescents have iron deficiency than their normal-weight peers.[3–6] Potential associations may include increased iron needs, genetics, poor diet quality with inadequate consumption of iron-rich foods, and physical inactivity.[3,4,6]

SCREENING

Recommendations for iron-deficiency anemia screening have been put forth by the Centers for Disease Control and Prevention (CDC),[1] the Institute of Medicine,[7] and the American Academy of Pediatrics (AAP).[8,9] While hemoglobin and hematocrit values, which are used to identify iron-deficiency anemia (Table 1) are consistent across the various recommendations, the recommended timing for screening infants and young children, as well as recommended screening tests, may differ. The distribution of hemoglobin and hematocrit values differs in children and adolescents and in males and females.

Hemoglobin is important to measure since it determines whether anemia is present; however, measuring hemoglobin alone may not be sufficient to identify iron-deficiency anemia, because hemoglobin has both low sensitivity and low specificity. The AAP recommends that the hemoglobin measure be accompanied by more

TABLE 1. MAXIMUM HEMOGLOBIN CONCENTRATION AND HEMATOCRIT VALUES FOR ANEMIA[a]

Sex/Age, y[b]	Hemoglobin, <g/dL	Hematocrit, <%
Males and Females		
1–<2[c]	11.0	32.9
2–<5	11.1	33.0
5–<8	11.5	34.5
8–<12	11.9	35.4
Males		
12–<15	12.5	37.3
15–<18	13.3	39.7
≥18	13.5	39.9
Females[d]		
12–<15	11.8	35.7
15–<18	12.0	35.9
≥18	12.0	35.7

[a]Source: Centers for Disease Control and Prevention.[1]
[b]Age- and sex-specific cutoff values for anemia are based on the 5th percentile from the third National Health and Nutrition Examination Survey (NHANES III).
[c]Although no data are available from NHANES III to determine the maximum hemoglobin concentration and hematocrit values for anemia among infants, the values listed for children ages 1 to <2 can be used for infants ages 6 to 12 months.
[d]Nonpregnant adolescents.

sensitive measures of iron status during screening if the infant's or child's (birth–3 years) hemoglobin is less than 11.0 mg/dL or if the infant or child is at high risk of iron deficiency or iron deficiency anemia.[9] These additional measures are described in the Assessment section.

INFANTS AND CHILDREN AGES 9 TO 18 MONTHS

The AAP and CDC recommend screening infants during the first year of life.[1,9] While the AAP recommends universal screening for iron deficiency and iron-deficiency anemia at about age 12 months,[9] the CDC recommends screening infants at high risk for iron-deficiency anemia or those with known risk factors for iron-deficiency anemia between ages 9 to 12 months and again 6 months later (ages 15–18 months).[1]

Infants and children considered at high risk for iron-deficiency anemia include[1]

- Infants and children from families with low incomes
- Infants and children who are eligible for the Special Supplemental Nutrition Program for Women, Infants and Children (WIC)
- Infants and children who are migrants or recently arrived refugees
- Infants and children who are Mexican-American[9]

Infants and children who have known risk factors for iron-deficiency anemia include[1]

- Infants born preterm or with low birth weight
- Infants fed non–iron-fortified infant formula for more than 2 months
- Infants fed cow's milk before age 12 months
- Infants who are breastfed infants and do not receive adequate iron from supplemental foods after age 6 months
- Children who consume more than 24 oz of cow's milk per day
- Children with special health care needs who use medications that interfere with iron absorption (eg, antacids, calcium, phosphorus, magnesium) or those with chronic infection; inflammatory disorders; restricted diets; or extensive blood loss from a wound, an accident, or surgery

CHILDREN AGES 2 TO 5

The AAP recommends the annual screening of children if any of the following risk factors are present[8]:

- Special health care needs
- Diet low in iron
- Vegetarian diet
- Low socioeconomic status
- Limited access to food

The CDC recommends the annual screening of children if any of the following risk factors are present[1]:

- Diet low in iron
- Limited access to food because of poverty or neglect
- Special health care needs
- Low income
- Eligible for WIC
- Migrants or recently arrived refugees

CHILDREN AGES 5 TO 12 AND ADOLESCENT MALES AGES 12 TO 18

The AAP recommends screening children who are consuming a strict vegetarian diet without iron supplementation. Additionally, the AAP recommends screening adolescent males during their peak growth period at a routine physical examination.[8]

The CDC recommends screening children and adolescent males with known risk factors for iron-deficiency anemia (eg, low iron intake, special health care needs, previous diagnosis of iron-deficiency anemia).[1]

ADOLESCENT FEMALES AGES 12 TO 21

The AAP recommends screening adolescent females during all routine physical examinations.[8]

The CDC recommends annually screening adolescent females with known risk factors for iron-deficiency anemia (eg, extensive menstrual or other blood loss, low iron intake, a previous diagnosis of iron-deficiency anemia). For those with no known risk factors, the CDC recommends screening every 5 to 10 years during routine physical examiantions.[1]

ASSESSMENT

If the infant's or child's (birth–3 years) hemoglobin level is less than 11.0 mg/dL or the infant or child is at high risk of iron deficiency or iron deficiency anemia, the AAP recommends any of the following sets of laboratory values for the assessment of iron-deficiency anemia:

- Hemoglobin and reticulocyte hemoglobin content (CHr)
- Hemoglobin, serum ferritin (SF), and C-reactive protein (CRP)

Hemoglobin is important to measure since it determines whether anemia is present; however, measuring hemoglobin alone may not be sufficient to identify iron-deficiency anemia, because hemoglobin has both low sensitivity and low specificity. The AAP recommends that the hemoglobin measure be accompanied by a more sensitive measure of iron status during screening.[9] The other laboratory tests—transferrin receptor concentration (TfR1), CHr, and SF—provide information about iron status. Hemoglobin along with TfR1 is the preferred test for screening for iron-deficiency anemia. However, standard values for infants and children have not been established. Additionally, the equipment used to assess TfR1 is not readily available in most areas. Reticulocyte hemoglobin content and TfR1 concentrations are not impacted by anemia of chronic disease, malignancy, or inflammation, thus would be preferable as biomarkers for iron status. Therefore, they are preferred over SF and CRP. A low CHr concentration is the strongest predictor of iron deficiency in children. Serum ferritin is affected by inflammation, infection, malignancy, and liver disease.[10] Serum ferritin should therefore be assessed along with a measure of acute phase reactants when used to assess iron status.[9]

The CDC uses age-specific cutoff points for hemoglobin and hematocrit (hematologic tests) as criteria for diagnosis of iron-deficiency anemia, but acknowledges that biochemical tests, such as SF, would detect earlier changes in iron status.

High altitudes and cigarette smoking increase anemia cutpoints (Table 2). Altitudes above 3,000 feet raise the cutpoint for anemia because of lower oxygen partial pressure, a reduction in oxygen saturation of blood, and an increase in red cell production. Cigarette smoking also raises the cutpoint for anemia because carboxyhemoglobin formed from carbon monoxide during smoking has no oxygen-carrying capacity.

TABLE 2. ADJUSTMENT OF MAXIMUM HEMOGLOBIN CONCENTRATION AND HEMATOCRIT VALUES FOR IRON-DEFICIENCY ANEMIA[a]

Altitude, ft	Hemoglobin Concentration, <g/dL	Hematocrit, <%
3,000–3,999	+0.2	+0.5
4,000–4,999	+0.3	+1.0
5,000–5,999	+0.5	+1.5
6,000–6,999	+0.7	+2.0
7,000–7,999	+1.0	+3.0
8,000–8,999	+1.3	+4.0
9,000–9,999	+1.6	+5.0
10,000–11,000	+2.0	+6.0
Cigarette smoking		
0.5–<1.0 pack per day	+0.3	+1.0
1.0–<2.0 packs per day	+0.5	+1.5
≥2.0 packs per day	+0.7	+2.0
Unknown level of smoking	+0.3b	+1.0

[a]Source: Centers for Disease Control and Prevention.[1]
[b]In place of the adjustments based on packs per day, a single hemoglobin concentration adjustment of 0.3 g/dL may be used for all smokers.

TREATMENT

Following the diagnosis of iron-deficiency anemia in an infant, child, or adolescent, families should receive information on treatment options. Treating iron-deficiency anemia involves both iron therapy and improving eating behaviors. After iron-deficiency anemia of dietary origin has been treated successfully, recurrence can be prevented with an improved diet.

IRON THERAPY

If low hemoglobin is confirmed, the following treatment is recommended:[1]

- Infants and children younger than 5: 3 mg/kg of body weight of elemental iron drops per day
- Children ages 5 to 12: one 60-mg elemental iron tablet per day
- Adolescent males ages 12 to 18: two 60-mg elemental iron tablets per day
- Adolescent females ages 12 to 18: one to two 60-mg elemental iron tablets per day

Iron supplementation is given through the administration of multivitamins—either drops, chewable multivitamin-mineral tablets, or tablets. The AAP recommends liquid iron sulfate drops or multivitamin drops with iron for children ages 12 to 36 months and chewable iron or multivitamin tablets with iron for children ages 3 years and older when iron supplementation is necessary.[9]

Oral iron preparations are absorbed most effectively when taken between meals or at bedtime. If gastrointestinal intolerance (eg, nausea, cramping, diarrhea, constipation) occurs, iron supplements can be taken with meals. Tolerance may also be improved by using a lower dosage, gradually increasing the dosage, or using a different form (eg, ferrous gluconate). Since iron absorption occurs primarily in the duodenum, timed-release iron preparations may be less effectively absorbed. Iron preparations should not be taken within 1 hour of substances that may inhibit iron absorption (eg, dairy products, casein, antacids, calcium supplements, coffee, tea, bran, whole grains). To prevent accidental poisoning, iron supplements should be stored out of the reach of infants and children.

Once treatment for iron-deficiency anemia is begun, screening for anemia should be repeated in 4 weeks.[1] If after the initial 4 weeks of treatment the anemia is not responsive to treatment, other laboratory tests, such as mean cell volume (MCV), red blood cell distribution width (RDW), and SF, should be obtained. Microcytic anemia is indicated by an MCV volume of less than 77 fL (femtoliters) in children ages 1 to 2, less than 79 fL in children ages 3 to 5, less than 80 fL in children ages 6 to 11, less than 82 fL in adolescents ages 12 to 15, and less than 85 fL in adolescents older than 15. However, a low MCV value alone cannot rule out anemia caused by lead poisoning, infection, chronic disease, or thalassemia.[1,10] An RDW value greater than 14% indicates iron deficiency; however, this cut-off value is instrument specific, so it may not apply to all equipment.[1] The RDW is often used in conjunction with the MCV laboratory test. A low MCV value and an RDW value greater than 14% is an indicator of iron-deficiency anemia. An SF value of 15 µg/L or less in infants older than 6 months, children, and adolescents indicates depleted iron stores. Ferritin values may be falsely elevated when infection, inflammation, or liver disease is present.[1,10] Serum transferrin-receptor concentration may be a more reliable indicator of iron stores because it is not influenced by chronic infection, inflammation, or disease.[1,10] Hemoglobin or hematocrit should be rechecked 6 months after completion of treatment for iron-deficiency anemia.

DIETARY STRATEGIES

Dietary strategies can improve iron status and help prevent recurrence of iron-deficiency anemia. Iron status can be improved through increased consumption of lean meat, fish, and poultry, which contain heme iron, an effectively absorbed form of iron from hemoglobin and myoglobin.[9] Meat, fish, and poultry also enhance absorption of the less bioavailable plant sources of iron (eg, fortified grains, dried peas and beans, spinach).

Sources of vitamin C (eg, citrus and vitamin C–fortified fruit juices, citrus fruit, strawberries, cantaloupe, green peppers, broccoli, cabbage) taken with meals increase the absorption of non-meat sources of iron by maintaining the iron in its reduced, more soluble form. The use of highly vitamin C–fortified breakfast cereals can also improve iron intake. Liver is not recommended because of its high cholesterol content and

potentially high level of environmental toxins. For those with iron-deficiency anemia, inhibitors of iron absorption, including dairy products, tea, bran, and coffee, should not be consumed in conjunction with iron-rich foods.[1,11]

ANTICIPATORY GUIDANCE

Primary prevention of iron-deficiency anemia should be achieved through diet. The following general guidelines are based on AAP and CDC recommendations for preventing iron-deficiency anemia in infants, children, and adolescents.[1]

INFANCY

- Breastfeed throughout the first year of life, with exclusive breastfeeding for the first 4 to 6 months (without supplementary liquid, formula, or food).[1,9]
- When exclusive breastfeeding is stopped, provide a supplemental source of iron (approximately 1 mg/kg of body weight/day), preferably from supplementary foods.[1]
- Use iron-fortified infant formula for infants who are not breastfed or who are partially breastfed.[1] Infants who are not breastfed should receive iron-fortified infant formula fortified with a maximum of 12 mg/L of elemental iron.[9]
- Encourage use of only breast milk or iron-fortified infant formula for any milk-based part of the diet, and discourage use of low-iron milk (eg, cow's, goat's, soy, rice) for infants.[1]
- Provide iron-containing foods (eg, red meats, vegetables containing iron, and iron-fortified infant cereal) when exclusive breastfeeding is stopped.
- Supplement with oral iron (1 mg/kg of body weight/day) exclusively breastfed infants beginning at age 4 months and continued until iron-rich complementary foods have been introduced.[9]
- Supplement with oral iron (1 mg/kg of body weight/day) for partially breastfed infants (who receive more than one-half of their daily feeding from breast milk) beginning at age 4 months and continue until iron-rich complementary foods have been introduced.[9]
- Encourage one feeding per day of foods and beverages rich in vitamin C by age 6 months.
- Introduce pureed fruits, vegetables, and meats after age 6 months or when the infant is developmentally ready to consume such foods.[1,13]

EARLY CHILDHOOD, MIDDLE CHILDHOOD, AND ADOLESCENCE

- Children ages 1 to 5 should consume no more than 24 oz of cow's, goat's, or soy milk per day.[1]
- Include sources of iron-rich foods (eg, fortified breakfast cereals, meat, fish, poultry) and vitamin C–rich foods (eg, citrus and vitamin C–fortified fruit juices, citrus fruit, strawberries, cantaloupe, green peppers, broccoli, cabbage) to enhance iron absorption.
- Limit snacks that are low in nutrients.
- Avoid skipping meals or chronic dieting.
- Limit coffee, tea, and colas.

REFERRAL

Referral to a registered dietitian is helpful in cases of severe or prolonged iron-deficiency anemia. All infants, children, and pregnant or lactating adolescents who are eligible should be referred to WIC. (See Tool J: Nutrition Resources.)

TABLE 3. IRON NEEDS FOR INFANTS, CHILDREN, AND ADOLESCENTS[a]

Age	Males, mg/day	Females, mg/day
Birth–6 months	0.27	0.27
7–12 months	11	11
1–3 years	7	7
4–8 years	10	10
9–13 years	8	8
14–18 years	11	15
19–21 years	8	18

[a]All values are recommended daily allowances except for infants from birth to age 6 months, which are based on adequate intake.[12]

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Nutrition and Sports

Whether children and adolescents are involved in competitive sports, strength training, or physical activity for fun and health, eating healthy foods and meeting nutritional needs is important. The healthy eating strategies discussed in this chapter can enhance performance in sports and physical activity while contributing to optimal growth, health, and physical and emotional development, and they are also integral components of weight management.

SIGNIFICANCE

Participating in physical activity during childhood and adolescence promotes fitness and is associated with a lower risk of overweight and obesity in adulthood.[1] There is strong evidence for the positive effect of physical activity during childhood and adolescence on bone health, and participating in physical activity positively affects academic performance, adiposity, blood pressure, cardiovascular health, lipoproteins, and mental health.[2]

Young athletes are vulnerable to misinformation about nutrition and to claims about unsafe practices that promise enhanced performance. Pressure from coaches and peers to achieve a competitive edge, as well as promotion of dietary supplements by prominent athletes, may encourage young athletes to experiment with such supplements and purported ergogenic aids (eg, protein beverages; weight-gain powders; amino acid, herbal, vitamin, and mineral supplements). Many ergogenic aids offer no benefits, and some are harmful. In a study conducted in 2006–2007, researchers found that up to 25% of dietary supplements bought in retail stores in the United States were contaminated with steroid-like substances, and up to 12% were contaminated with banned stimulants. Samples were obtained from various retail stores throughout the United States, as well as from popular online stores.[3] An athlete who consumes some of these contaminants could fail a steroid screen and be suspended from competition.

Inappropriate use of dietary supplements, unsafe weight-control methods, and unhealthy eating practices can adversely affect strength and endurance, jeopardize health, negate the benefits of training, and result in suspension from sports; such use also runs counter to assumptions about fair play in sports. Research continues to support recommendations to improve performance through a combination of safe training and healthy eating practices, not through ingesting dietary supplements and ergogenic aids.

NUTRITIONAL ADEQUACY

Children and adolescents who compete in sports can achieve an adequate, balanced intake of nutrients by following the *Dietary Guidelines for Americans*.[4] The nutrient needs of young athletes are similar to those of non-competing children and adolescents, except that young athletes need to consume more energy (ie, calories), more water and, in some cases, more protein.

ENERGY

Physical activity increases the body's need for energy. The amount of additional energy the body requires depends on the type, frequency, intensity, and duration of the activity. Young athletes may need 500 to 1,000 additional calories per day; growth, weight, weight change with increases in training, symptoms of fatigue, athletic performance, and appetite help indicate whether energy intake is sufficient. The Dietary Reference Intake (DRI) for energy and the estimated energy requirements (EERs) are based on age, sex, weight, height, energy expenditure, requirements for growth, and physical activity level.[5] Table 1 presents examples of EERs based on age, reference weights and heights, and physical activity levels. Estimated energy requirements for children and adolescents whose weights or heights are higher or lower than the reference weights and heights should be adjusted accordingly.

CARBOHYDRATES

To perform optimally, children and adolescents who compete in sports need to consume a diet high in carbohydrates: grains, whole-wheat bread and cereal, pasta, potatoes, fruits, vegetables, and low-fat dairy products. Moderate amounts of sugar may also help to meet carbohydrate needs.[7] Inadequate carbohydrate intake may be associated with fatigue, weight loss or inability to gain weight, and decreased performance. For athletes who train intensively, for example those competing at the national or international levels, the recommended carbohydrate intake is 60% to 70% of total calories consumed; for athletes who train more moderately, 55% to 65% is probably preferable. Table 2 provides daily ranges for carbohydrate consumption based on weight and activity level.[8] The amount of carbohydrates required depends on the athlete's sex, weight, energy expenditure, level of physical activity, and type of sport performed, as well as on environmental factors.[9]

TABLE 1. EXAMPLES OF ESTIMATED ENERGY REQUIREMENTS FOR MALE AND FEMALE CHILDREN AND ADOLESCENTS AGES 8 TO 18[a]

Age		Reference Weight, kg (lbs)	Reference Height, m (in)	Low Active PAL[b]	Active PAL[b]	Very Active PAL[b]
8	Male	25.6 (56.4)	1.28 (50.4)	1,692	1,931	2,225
	Female	25.6 (56.4)	1.28 (50.4)	1,593	1,810	2,173
10	Male	31.9 (70.3)	1.39 (54.7)	1,875	2,149	2,486
	Female	32.9 (72.5)	1.38 (54.3)	1,729	1,972	2,376
12	Male	40.5 (89.2)	1.49 (58.7)	2,113	2,428	2,817
	Female	41.6 (91.6)	1.51 (59.4)	1,909	2,183	2,640
14	Male	51.0 (112.3)	1.64 (64.6)	2,459	2,829	3,283
	Female	49.4 (108.8)	1.60 (63.0)	2,036	2,334	2,831
16	Male	60.9 (134.1)	1.74 (68.5)	2,736	3,152	3,663
	Female	53.9 (118.7)	1.63 (64.2)	2,059	2,368	2,883
18	Male	67.2 (148.0)	1.76 (69.3)	2,823	3,263	3,804
	Female	56.2 (123.8)	1.63 (64.2)	2,024	2,336	2,858

[a]Adapted with permission from: National Academies Press.[5]
[b]PAL indicates physical activity level; low active PAL, less than 1 hour/day of physical activity; active PAL, about 1 hour/day of physical activity; very active PAL, more than 1 hour/day of physical activity.[6]

TABLE 2. DAILY RANGES FOR CARBOHYDRATE CONSUMPTION BASED ON PHYSICAL ACTIVITY LEVEL[a]

Intensity of Activity	Carbohydrate (g/kg/day)
None or light training	3–5 g/kg/day
Moderate or heavy training	5–8 g/kg/day
Pre-event (24–48 hours)	8–9 g/kg/day
Post-event (within 2–3 hours)	1.5 g/kg within the first hour; then 1.5 g/kg within the next 2–3 hours

[a]Source: American Dietetic Association.[9]

PROTEIN

The protein requirements of most young athletes can be met by consuming approximately 1 g protein per kilogram of body weight per day. Athletes participating in intense endurance sports or strength training may require 1.5 to 2 g protein per kilogram of body weight per day;[9] however, most children and adolescents in the United States consume 1.5 to 3 times their DRIs for protein,[5,9] so it is likely that protein needs can be met by eating a variety of nutritious foods without adding protein supplements. However, protein intake should be monitored for young athletes who are restricting food intake.

Higher consumption of proteins and the use of protein or amino acid supplements (misleadingly promoted as "safe" alternatives to steroids) are not beneficial and also increase urinary excretion of calcium. Protein intake beyond the amount needed also leads to extra energy intake and fat storage. Athletes who eat increased amounts of protein or take amino acid supplements may view these as substitutes for other foods and thus neglect important nutrients.

VITAMINS AND MINERALS

A balanced variety of foods that meet the body's energy needs also meet the requirement for sufficient vitamins and minerals. Nutrients reported most often in less than adequate amounts for children and adolescents include iron; calcium; and vitamins A, C, E, and B6.[10,11]

Iron is particularly important for young athletes because there are increased needs for growth, expansion of red blood cell volume, and addition of lean body mass. Menstruating females may be particularly susceptible to iron-deficiency anemia, which can lead to poor stamina, poor performance, and decreased ability to learn. Prevention should focus on regular consumption of adequate sources of iron that are acceptable to the child or adolescent. The best sources of iron are meat, fortified grains, and dried beans. The DRI for iron for males ages 14 to 18 is 11 mg/day and for females ages 14 to 18 is 15 mg/day.[12]

Adolescents' intake of calcium and vitamins A, C, and B6 may be inadequate because adolescents often avoid fruits, vegetables, and dairy products. Calcium is especially critical for adolescents because the DRI for calcium increases to 1,300 mg/day for children and adolescents ages 9 and older, up from 800 mg/day for children ages 4 to 8.[13] If young athletes do not consume sufficient quantities of dairy products, (ie, 4 servings per day), they should take a calcium supplement, such as calcium carbonate.[8] Inadequate calcium consumption may place female athletes at risk for stress fractures and osteoporosis.[10]

PREGAME AND POSTGAME MEALS

Consuming a light meal high in complex carbohydrates (eg, rice, pasta, bread) and ample caffeine-free beverages (eg, fruit juice, water) is recommended 3 to 4 hours before an event to prevent hunger, provide energy, ensure gastric emptying, and prevent respiratory and cardiac stress. During physical activities involving several events, energy can be obtained by consuming sports drinks or unsweetened fruit juice diluted to one-half strength with water up to 1 hour before physical activity. If events are 1 to 3 hours apart, carbohydrate snacks (eg, cereal bars, sports bars, crackers, fruit, whole-wheat bread, bagels) or liquid meals are recommended. After physical activity, it is important to replace muscle and liver glycogen stores by consuming carbohydrates within 2 hours. Drinking beverages containing carbohydrates should be encouraged if foods are

not well tolerated or not available within 2 hours after physical activity. See Table 3 for suggested meal and snack timing for athletes.

FLUIDS AND ELECTROLYTES

Adequate fluid intake and prevention of dehydration are critical for effective energy metabolism, performance, and body cooling. The risk of dehydration becomes greater with increased heat, humidity, intensity or duration of physical activity, body surface area, and sweating. Children are at greater risk for dehydration and heat-related illness than adolescents or adults because children generate more heat relative to their body weight, sweat less, take longer to acclimatize, and absorb more heat from the environment owing to the higher ratio of their skin surface area relative to their body weight compared with adults.[14]

Inadequate fluid intake can result in dehydration and heat-related illness. To ensure adequate hydration in children and adolescents, note the following key principles[14]:

- Adequate fluid intake can prevent dehydration and serious problems, but thirst is not an adequate indication of the body's need for fluids.
- Drinking 16 oz of water 1 to 2 hours before the event is recommended followed by 12 oz of water 15 minutes before the event and 4 to 8 oz of water every 15 to 20 minutes during the event.
- During hot or humid weather, for strenuous physical activity or events lasting more than 60 minutes, muscle glycogen can be conserved and fatigue reduced by consuming drinks containing 4% to 8% carbohydrates (10–18 g carbohydrates per 8 oz). Examples include (1) unsweetened fruit juice diluted with an equal amount of water and (2) sports drinks. Newer formulated sports drinks provide a lower carbohydrate content of 2% to 3%. These drinks are adequate for hydration but do not provide extra carbohydrates for energy.
- Cool drinks, including water (40°F–50°F), are absorbed most quickly.
- Water can be more palatable for some children and adolescents if flavoring (eg, lemon slices) is added.
- After physical activity, drinking 16 oz of fluid per pound of weight lost will restore water balance and allow optimal performance in subsequent physical activity sessions.
- Undiluted fruit juice, carbonated or caffeine-containing beverages (including soft drinks), and fruit punches should not be consumed immediately before or during physical activity because they may cause cramping or diarrhea.
- During hot weather, closely monitor children and adolescents who use exercise equipment (eg, helmets, padding). These kinds of equipment can lead to greater heat generation and prevent sweat from evaporating, thus increasing body temperature.

TABLE 3. SUGGESTED MEAL AND SNACK TIMING FOR ATHLETES

Meal/Snack	Timing	Examples
Snack (15–20 g carbohydrates, <5% fat)	½–1 hour before event	Pretzels and fluids (eg, sports drink, water, lemonade)
Light meal (30–40 g carbohydrates, 5%–15% fat)	2–4 hours before event	Turkey sandwich, pretzels, fruit, fluids (eg, sports drink, water, lemonade). Limit fiber to avoid bloating.
Heavy meal (50–60 g carbohydrates, 15%–25% fat)	4–5 hours before event (may need a snack later)	Baked chicken, potatoes, fruit, and bread, or peanut butter sandwich, baked chips, and fruit plus fluids (eg, sports drink, water, lemonade). Limit fiber.

The American College of Sports Medicine provides recommendations for prevention and intervention of heat illness. This statement is based on nonrandomized trials and observational studies and panel consensus judgment.[14] Table 4 presents a summary of the recommendations from this consensus statement.

Heat-related illness can be critical and sometimes life-threatening. It is important for health professionals, coaches, parents, and adolescents to be able to recognize the signs and symptoms of heat illness and the recommendations for treating heat-related events. Table 5 reviews the 3 types of heat-related illness.

TABLE 4. HYDRATION RECOMMENDATIONS FOR THE PREVENTION AND INTERVENTION OF HEAT ILLNESS[a]

Time	Rehydration Amounts
1–2 hours before physical activity	12–22 oz cool water (50°F–60°F) but always lower than the ambient temperature
10–15 minutes before physical activity	10–20 oz cool water (50°F–60°F)
During physical activity	4–6 oz cool water every 15–20 minutes
After physical activity	2–3 cups (16–24 oz) cool fluids (50°F–60°F) for every pound of weight lost

[a]Source: American College of Sports Medicine.[14]

TABLE 5. HEAT-RELATED ILLNESS: SIGNS, SYMPTOMS, AND TREATMENT[a]

Illness	Signs and Symptoms	Treatment
Heat cramps	Disabling muscular cramps Thirst Chills Rapid heart rate Normal body temperature Alertness Normal blood pressure Nausea	Give child or adolescent 4–8 oz of cold water every 10–15 minutes. Make sure child or adolescent avoids beverages that contain caffeine. Move child or adolescent to a cool place. Remove as much clothing and equipment as possible. Provide passive stretching. Apply ice massage to cramping muscles.
Heat exhaustion	Sweating Dizziness Headache Confusion Lightheadedness Clammy skin Flushed face Shallow breathing Nausea Body temperature of 100.4°F–104°F	Give child or adolescent 16 oz of cold water for each pound of weight lost. Move child or adolescent to a cool place. Remove as much clothing and equipment as possible. Cool child or adolescent (eg, with ice packs, ice bags, immersion in ice water).
Heat stroke	Shock Collapse Body temperature >104°F Delirium Hallucinations Loss of consciousness Seizures Inability to walk	Call for emergency medical treatment. Cool child or adolescent (eg, with ice packs, ice bags, immersion in ice water). Give intravenous fluids.

[a]Source: Maughan.[15]

SPECIAL CONSIDERATIONS

ANEMIA

Strenuous physical activity or intensive training may be associated with iron-deficiency anemia. Contributing factors include decreased iron absorption, marginal iron intake, hemodilution (leading to a pseudoanemia but with no reduction in oxygen-delivering capacity), increased destruction of erythrocytes in circulation, and foot strike hemolysis.[7] Iron-deficiency anemia is not a contraindication to continued training; however, the etiology of the anemia should be evaluated, treatment initiated, and a follow-up plan developed by a health professional before clearing the athlete without restriction for sports. (See the Iron-Deficiency Anemia chapter.)

Young female distance runners are most at risk for iron-deficiency anemia, but there are no recommendations for routine screening for iron status. However, for young female athletes whose body weight is low normal to below normal or those at risk for iron-deficiency anemia because of inadequate intake, an empiric trial of iron supplementation (eg, 325 mg ferrous sulfate in the form of 1 to 2 tablets per day with orange juice or another source of vitamin C) is reasonable as an attempt to prevent reduced iron stores. Otherwise, a biochemical assessment of iron status can be considered.

WEIGHT STATUS

Losing excess body fat is a long-term process involving healthy food choices as well as physical activity. For young athletes, this process should be initiated several months before the start of the athletic season. Severe energy restriction and weight loss of more than 2 pounds per week can result in the loss of muscle mass and compromised growth and development. Weight maintenance and increased physical activity, rather than weight loss, are appropriate goals for athletes who are still growing. Loss of body fat can be facilitated through physical activity (eg, power walking, cycling) at 60% to 80% of maximum aerobic capacity for 60 minutes 5 to 6 times per week.

Rapid weight-loss (eg, severe food restriction, dehydration, purging, excessive exercise) and weight-management techniques practiced by some athletes (eg, wrestlers, dancers, gymnast) can be dangerous. In addition to decreased muscle strength and endurance, side effects may include hypoglycemia, depletion of electrolytes and glycogen stores, and nutrient deficiencies. Chronic energy restriction combined with medical complications may suggest the presence of eating disorders, which, if persistent, can compromise growth and development. Sufficient time should be allotted for gradual and appropriate weight loss. For athletes who need to lose weight, losing 1 to 2 pounds per week is recommended.

Adolescents who wish to increase muscle mass should be advised to combine strength training with a balanced intake of healthy foods providing an additional 500 to 1,000 calories per day. This should result in a weight gain of 1 to 2 pounds per week. Foods chosen should be low in fat, cholesterol, and sugar and high in complex carbohydrates.

STRENGTH TRAINING

Properly prescribed and supervised strength training as part of a total fitness program can improve body composition, increase muscular strength and endurance, and improve overall fitness and performance in sports and recreational activities. Strength training can increase muscle size in adolescents. Prepubertal children who strength train increase strength via increased recruitment of muscle fibers by peripheral nerves, and not by increased muscle bulk. Strength training in children and adolescents is safe, but to prevent injury of the long bones and back, children should not lift maximum or near-maximum weights. Weights that can be lifted for 6 repetitions or more are appropriate.[16]

EATING DISORDERS

Restricted food intake, binge-eating, purging, and unhealthy weight-loss practices can occur among young athletes in all sports, but they are more common in weight-related activities (eg, wrestling, running) and in "appearance" sports (eg, gymnastics, ballet, figure skating). Eating disorders may be associated with electrolyte imbalances, nutrient deficiencies, amenorrhea, and impaired growth and development. These medical complications may be life-threatening in extreme cases. (See the Eating Disorders chapter.)

An issue of major concern in female athletes is the interrelationship between eating disorders, amenorrhea, and osteoporosis, which has been labeled the "female athlete triad." Some female athletes develop eating behaviors that can lead to weight loss, amenorrhea, and negative consequences for bone health (ie, premature bone loss, decreased bone density, increased risk of stress fractures). It is important to identify and treat this condition early, because bone loss resulting from malnutrition may be irreversible despite weight gain, estrogen replacement, calcium supplementation, and resumption of menstrual periods.

SUPPLEMENTS

The American Academy of Pediatrics strongly discourages the use of performance-enhancing substances for athletic or other purposes.[17] Other organizations, including the National Federation of State High School Associations and the National Collegiate Athletic Association, have put forth similar recommendations. Additionally, several states have banned the sale or distribution of performance-enhancing substances to children and adolescents, and other states have proposed such a ban.

Performance-enhancing substances may pose a significant health risk to children and adolescents. Unfortunately, a great deal of misinformation exists about supplements and their contribution to athletic performance. Parents, coaches, and school and sports organizations need to stress the importance of eating nutritious foods and of seeking accurate information from appropriate professionals (eg, sport medicine physicians, sports nutrition dietitians) so that young athletes and their parents can make informed choices.

One popular supplement, creatine, may promote increased muscle mass when combined with strength training and may result in improved short-duration, high-intensity physical activity. However, it has not been established that creatine consumption translates into improved performance beyond that associated with training alone, without creatine consumption. Side effects of creatine include nausea and muscle cramps. Creatine is sometimes contaminated with stimulants and steroid-like substances. There is insufficient information on the long-term risks of using creatine, and it is not recommended for young athletes.

SCREENING AND ASSESSMENT

The nutritional adequacy of typical eating practices as well as specialized training diets can be evaluated using the *Dietary Guidelines for Americans*.[4] To screen and assess children and adolescents for adequate nutrition, it is important to determine the following:

- Intake of calcium and iron (from foods)
- Pregame and postgame eating practices
- Fluid intake before, during, and after competition
- Use of all dietary supplements, including vitamin and mineral supplements
- Weight-control practices, including restrictive eating and binge-eating/purging activity
- Use of purported ergogenic aids (eg, caffeine, steroids, amphetamines, creatine, chromium picolinate)
- Height, weight, and body mass index (which should be measured annually and evaluated in relation to age and gender growth curves)
- Menstrual history
- Type, frequency, intensity, and duration of physical activity to help determine energy needs
- For wrestlers, desired weight classification for competition and training activities (urine-specific gravity measurements may be indicated if dehydration before weight certification is suspected)

ANTICIPATORY GUIDANCE

Children, adolescents, parents, and coaches should receive information about sound nutrition practices for participants in sports and recreational physical activities. Questions about nutrition and physical activity can be best answered by a registered dietitian with expertise in sports nutrition. The following general guidance may be helpful for health professionals when sharing information on nutrition and physical activity with children, adolescents, and their parents and coaches.

CHILDREN AND ADOLESCENTS

- Discuss the risks of dehydration and the recommendations for fluid intake and fluid replacement needs after physical activity. For players involved in practices that are associated with increased risk of heat injury (eg, daily summer football practices), explain that it may be helpful to weigh players daily to monitor otherwise underappreciated fluid losses (2%–3% fluid losses), which are cumulative over a series of days.
- Advise children and adolescents to consume complex carbohydrates at each meal (eg, rice, pasta, bread, bagels, corn, potatoes, sweet potatoes, tortillas, cereal).[4]
- Tell children and adolescents to maintain a diet in which fat intake is no less than 25% and no more than 35% of total energy.
- Caution against high protein intake (ie, >2 g protein per kilogram of body weight per day) and against the use of protein or amino acid supplements.
- Discuss the dangers of using steroids and amphetamines (including the risk of contaminants, since these ergogenic aids are not regulated by the Food and Drug Administration) and the ineffectiveness of other ergogenic aids and dietary supplements.
- Caution against rapid weight-loss techniques, and explain their adverse effects on health and performance.
- Discuss pregame and postgame meals and recommended snacks, fast foods, and convenience store foods when traveling (eg, low-fat yogurt; reduced-fat [2%], low-fat [1%], or fat-free [skim] milk; yogurt cones and shakes; bananas; string cheese; grilled chicken; submarine sandwiches; light tacos and burritos; thick-crust cheese or vegetable pizza; muffins; bagels; trail mix).
- Demonstrate how to monitor pulse rate and, for those trying to lose fat mass, encourage aerobic physical activity at 60% to 80% of maximum heart rate while training.

PARENTS AND COACHES

- Enlist parental and coaching support in making healthy foods available. One place to start is the parents who prepare team pregame and postgame meals and snacks. Encourage parents to purchase or prepare healthy meals and snacks (Table 6).
- Advise parents to discourage unhealthy weight-loss practices or supplement use.

TABLE 6. SUGGESTIONS FOR HEALTHY MEALS AND SNACKS

Breakfast		Recommendations
Bran muffin Low-fat milk Fresh fruit	English muffin 1 egg Orange juice Low-fat yogurt	For a meal high in carbohydrates, select foods such as pancakes, waffles, French toast, bagels, muffins, and juice. When traveling, pack juice, dried fruit, fresh fruit, and bagels. Avoid foods high in fat (eg, bacon, sausage).
Lunch		
Turkey sandwich Low-fat yogurt Baked chips	Baked chicken Baked potato Fresh or canned fruit	Avoid high-fat meats and fried foods (eg, fish, chicken, or french fries).
Dinner		
Spaghetti with marinara sauce and parmesan cheese Bread sticks Fruit juice	Thick-crust cheese or vegetarian pizza Salad Fruit juice	When traveling, select foods such as pasta, baked potatoes, rice, breads, and salads. Order thick-crust pizza with vegetable toppings (eg, green peppers, tomatoes, mushrooms) instead of meat (eg, sausage, pepperoni).
Snacks (depends on timing of event)		
Pretzels Juice or sports drinks	Fruit Bagel or English muffin with jam	Avoid foods high in fat and high in protein. Avoid food products with simple carbohydrates (eg, candy, soft drinks).

REFERRAL

Referral to a registered dietitian is recommended for young athletes, coaches, or parents who have questions about healthy eating, supplements, or preventing heat illness. A referral is also recommended for young athletes who have any of the following conditions: eating disorders, unhealthy eating practices, strict vegetarian eating practices, obesity, underweight, or iron-deficiency anemia. (See Tool J: Nutrition Resources.)

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The Importance of Drinking Sufficient Fluids in Hot Weather

The physician explains that young children are at higher risk than adolescents or adults for dehydration and heat stroke because their bodies generate more heat and are less effective at getting rid of it compared with adults.

Roberto Garza is a 10-year-old boy who plays baseball in a community league coached by parents. He lives in an area where the summer weather is hot and humid, and practice is scheduled in the afternoon, when the temperature is quite hot. Roberto often complains of being thirsty during practice, and his father is concerned because the coaches don't schedule water breaks.

During a routine sports physical, Mr Garza discusses his concerns with Roberto's physician, Dr Rahman. The physician explains that children are at higher risk than adolescents or adults for dehydration and heat stroke because their bodies generate more heat. "Children need to drink additional fluids in hot weather to prevent dehydration and other serious problems," advises Dr Rahman. "Thirst is not an adequate indication of the body's need for fluids because physical activity can sometimes mask children's sense of thirst, making them even more vulnerable to dehydration."

Dr Rahman gives Mr Garza a pamphlet that discusses the importance of replacing fluids during physical activity and asks him to share the information with Roberto's coaches.

Dr Rahman gives Mr Garza a pamphlet that discusses the importance of replacing fluids during physical activity and asks him to share the information with Roberto's coaches. The pamphlet states that children should drink 4 to 8 oz of water or other fluids every 15 to 20 minutes during physical activity, and they should be allowed water breaks as needed. The pamphlet also advises parents and coaches to monitor each child's weight before and after physical activity. Any weight that is lost during physical activity is probably due to loss of body water and should be replaced after activities by drinking fluids at the rate of 16 oz of water for each pound lost.

Mr Garza shares the pamphlet with the coaches; as a result, the children are allowed both scheduled and unscheduled water breaks. In addition, the team manager has started to monitor the baseball players' fluid intake to be sure they are drinking enough.

Obesity

BACKGROUND

Based on measured heights and weights from nationally representative samples of children and adolescents assessed during the National Health and Nutrition Examination Surveys (NHANES) (1976–1980 and 2003–2008), obesity prevalence has risen in children aged 2 to 5 years, from 5.0% to 10.4%; in children aged 6 to 11 years, from 6.5% to 19.6%; and in adolescents aged 12 to 19 years, from 5.0% to 18.1%.[1] The obesity epidemic has disproportionately affected some racial-ethnic and economic groups.[2] In 2007–2008, the prevalence was particularly high among 2- to 19-year-old African-American females (22.7%) and among 2- to 19-year-old Hispanic males, including Mexican-American males (24.4%).[1] Prevalence has also increased among Native American and Asian-American children and adolescents. Poverty has been associated with higher obesity prevalence among adolescents; however, subgroups have differed. Health professionals are faced with addressing this problem in a steadily increasing number of children and adolescents.

The consequences of this epidemic are not simply cosmetic. A child or adolescent who is obese often remains obese into adulthood, with higher degrees of excess weight associated with increasing risk of persistence.[3] Obesity is associated with many chronic health conditions, including diabetes mellitus, hypertension, dyslipidemia, nonalcoholic steatohepatitis, and cardiovascular disease.[4] With increasing number of obese children and adolescents, these chronic conditions, previously identified only in adults, are present in adolescents and even among younger children. These health issues among children and adolescents lead to increased health care costs, and the future costs of these chronic conditions will be heavy indeed. The overweight and obese child or adolescent experiences stigmatization and poor quality of life.[5]

DEFINITIONS AND TERMINOLOGY

Body mass index (BMI), a measure of body weight adjusted for height, is a useful tool to assess body fat. Although BMI does not directly measure body fat, it can be used as a screening tool because it correlates with body fat and health risks and is clinically feasible. Body mass index is defined as weight (kilograms) divided by the square of height (meters): wt (kg)/ht $(m)^2$. In children and adolescents, the distribution of BMI changes with age, just as weight and height distributions change. As a result, while absolute BMI is appropriate to categorize body weight in adults, percentiles specific for age and gender from reference populations define underweight, healthy weight, overweight, and obesity in children and adolescents.[6]

Standard reference curves are derived from data collected before obesity prevalence began to rise. Using these reference curves, a BMI at the 95th percentile or greater defines obesity.[6] Almost all children and adolescents with BMI in this range are likely to have excess body fat and associated health risks. A BMI at the 85th percentile to 94th percentile defines overweight.[6] Children and adolescents with BMI in this range often have excess body fat and health risks, although for some the BMI category will reflect high lean body mass rather than fat. These definitions are most useful to define adiposity risk for populations, but for individual children and adolescents, health professionals need to review growth pattern, family risks, and medical conditions to assess risk and determine how to approach the child or adolescent and family. The use of 2 cutpoints, and 85th percentile and the 95th percentile BMI, captures varying risk levels and minimizes both over- and underdiagnosis.

Several other definitions are important. *Under 2 years:* The Centers for Disease Control and Prevention (CDC) growth charts provide weight-for-length norms rather than BMI norms in this age group. Weight for length greater than the 95th percentile defines overweight with no specific cutpoint for obesity. *Late adolescence:* The adult cutpoint for overweight (BMI = 25 kg/m^2) can be used to define overweight in late adolescence even when the 85th percentile is defined by a higher absolute BMI. For example, a female adolescent of 17 years, 4 months with a BMI of 25.2 is at the 84th percentile. Even though her BMI is slightly below the 85th percentile, the BMI is in the overweight category because it is above the adult cutpoint for overweight of 25 kg/m^2. Similarly, the adult definition of obesity (BMI ≥30 kg/m^2) can be used in late adolescence when this value is lower than the 95th percentile.

Severe obesity is also increasing in prevalence among children and adolescents, and they are at high risk for multiple cardiovascular disease risk factors and greater health risk.[7,8] There is not consensus on a definition of severe obesity. The expert committee suggested use of 99th percentile based on cutpoints defined by Freedman and colleagues[7] from NHANES data, but the sample of children and adolescents with BMI at this level was small, and so more valid cutpoints may soon supercede this information. However, children and adolescents with BMI at or above this level have higher health risk and therefore intervention is more urgent. Health professionals should ensure that best efforts are made to provide treatment to children and adolescents whose BMI for age and gender is above the 97th percentile, which is the highest curve available on the growth charts.

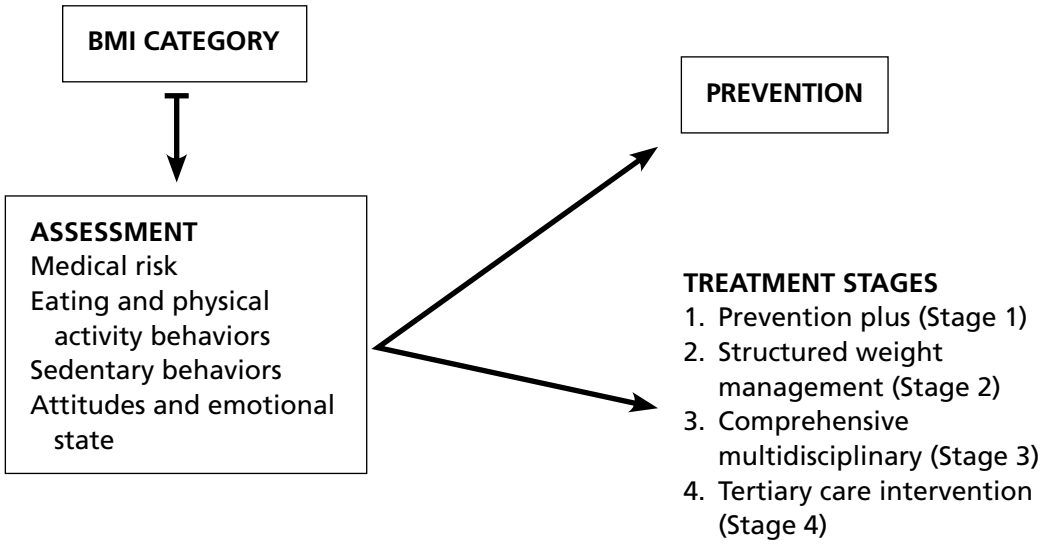
SCREENING AND ASSESSMENT

UNIVERSAL ASSESSMENT OF OBESITY RISK[6,9]

Screening for obesity risk, an ongoing process, starts with BMI evaluation (or weight for length if child is <2 years of age), and then incorporates evaluation of medical conditions and risks, current behaviors, and family attitudes and psychosocial situation. Based on this information, health professionals can provide obesity prevention (teaching or reinforcing behaviors that will promote sustained healthy weight, such as increasing fruit and vegetable intake and physical activity, decreasing television viewing, and decreasing sugar-sweetened beverages and high-calorie foods) or obesity treatment (guidance to improve weight) (Figure 1). In general, children and adolescents with BMI for age and gender below the 85th percentile will benefit from prevention anticipatory guidance, which will guide them toward healthier behaviors or reinforce current healthy behaviors. This guidance should be framed as growing healthy bodies rather than achieving a specific weight. Children and adolescents whose BMI is in the overweight category require special attention. Some children and adolescents may have healthy body weight but others may have excess fat and health risk and will benefit from attention to weight control. A "wait-and-see" approach may result in a missed opportunity to prevent progression. Most children and adolescents whose BMI is in the obese category will benefit from intervention to control weight.

1. *BMI calculation and plotting on the appropriate growth curve at least once a year to identify current category.* Underweight (<5th percentile), healthy weight (5th–84th percentile), overweight (85th–94th percentile), obese (≥95th). Calculators, wheels, tables, and nomograms are

FIGURE 1. UNIVERSAL ASSESSMENT OF OBESITY RISK



some of the tools used to calculate BMI, which then is plotted on a growth chart, available online from the CDC.

2. *Medical assessment.* Includes family history in first- and second-degree relatives (siblings, parents, aunts, uncles, and grandparents) of diabetes mellitus and cardiovascular disease risk factors like hypertension and dyslipidemia. In addition, a medical professional should perform a medical history and physical examination for current obesity-related conditions. In the case of severe obesity, a medical professional can evaluate for rare cases of underlying syndromes. Depending on BMI category, age, and family history, laboratory evaluation may be needed for several obesity-related conditions that often have no signs or symptoms, including dyslipidemia, diabetes, and nonalcoholic fatty liver disease.
3. *Dietary, physical activity, and sedentary behavior assessment.* A brief assessment of foods and beverages typically consumed and the pattern of consumption can uncover modifiable behaviors associated with excess caloric intake. Sugar-sweetened beverages, fruit and vegetable servings, and meals prepared outside the home are often important areas to address initially. A dietitian can do a thorough evaluation when detail is needed or when initial obvious excesses have been addressed. Assessment of age-appropriate vigorous activity, both structured and unstructured, and routine activity, like walking to school or doing chores, can determine approximate amount of time spent being physically active, again with the goal of identifying opportunities for increased activity. Number of hours of television watching is associated with increased risk of obesity, and reduction in these hours improves weight control. Therefore, asking about hours of television viewing and other "screen time" (eg, computers, video games) will uncover a very important opportunity to modify behavior for improved energy balance.
4. *Attitude and emotional state.* Families may not recognize excess weight or the risk of obesity development. Or they may be unwilling or unable to make behavior changes to improve eating and physical activity. Prior to providing anticipatory guidance about new behaviors, health professionals should assess attitude and capacity for change.

PREVENTION

The target of obesity prevention should begin at birth or before.[10] Lifestyle behaviors to prevent obesity, rather than intervention to improve weight status, should be the aim of anticipatory guidance for children and adolescents with healthy BMI for age and gender (5th–84th percentile), and some children and adolescents with

BMIs in the overweight category (85th–94th percentile), depending on their growth pattern and risk factors. Health professionals should be aware of the increased risk of obesity in children and adolescents with parents who are obese and those whose mothers had diabetes mellitus during the child's gestation.

Although defining the contribution of a specific behavior over time to obesity prevention is difficult, the following specific eating and activity behaviors have some scientific support for promotion of energy and nutritional balance:

- Limited sugar-sweetened beverages.
- Recommended quantities of fruits and vegetables.
- Limited television and other screen time to not more than 2 hours per day, with no television viewing before age 2 years. Televisions and other screens should not be in the child's or adolescent's primary sleeping room.
- Breakfast daily.
- Limited eating at restaurants, particularly fast-food restaurants.
- Meals together as a family as much as possible.
- Appropriate portion size, which may differ from the serving size on the food label.
- A diet with foods high in calcium.
- A diet with foods high in fiber, including whole grains.
- A diet with foods balanced in macronutrients (calories from fat, carbohydrate, and protein in proportions for age recommended by the Dietary Reference Intakes).
- Exclusive breastfeeding to age 6 months and maintain breastfeeding after introduction of solids to age 12 months and beyond.
- Moderate to vigorous age-appropriate physical activity for at least 60 minutes each day.
- Limited consumption of high-calorie, especially low-nutrient, foods.

The complexity of obesity prevention lies less in the identification of target health behaviors and much more in the process of influencing families to change behaviors when habits, culture, and environment promote less physical activity and more energy intake. Health professionals can adopt specific techniques of interaction with families and create office systems that support ongoing commitment to obesity prevention. Although limited research is available for use in clinical practice, the approaches described below may be useful guides for counseling overweight and obese children, adolescents, and their families.

Language. Health professionals should convey support and empathy. When they identify a problem, they should choose words carefully, avoiding "fatness" and "obesity," which many perceive as derogatory, and using neutral terms, such as "weight," "excess weight," and "BMI."

Cultural and economic awareness. Cultural differences in perceptions of what constitutes an attractive or healthy weight, the importance of physical activity, desirable foods, and other attitudes may influence a family's motivation to address weight. Community environments, such as lack of safe recreation areas, may be barriers to change. Health professionals should become knowledgeable about the values or circumstances that may be common in the population they serve, especially if that population differs from their own. In addition, a health professional's knowledge of a family's personal values and circumstances may be most helpful in tailoring recommendations.

Effective parenting. Because parents and other caregivers help the child or adolescent develop healthy habits, health professionals can teach and motivate parents to use their authority and to be good role models. In young children, health professionals will focus the discussion on parenting behavior. In adolescents, health professionals should discuss health behaviors directly with them but also encourage parents to make the home environment as healthy as possible.

Stages of change (readiness to change). Before a person is ready to change a behavior, he or she needs to be aware of a problem, then plan to address it, and finally actually begin the new behavior. A health professional can help children, adolescents, and their families move along these stages rather than prescribe a new behavior to those who are not ready. (See Tool F: Stages of Change—A Model for Nutrition Counseling.)

Motivational interviewing. This technique uses nonjudgmental questions and reflective listening to uncover a child's, adolescent's, or parent's beliefs and values. The health professional can evoke motivation rather than try to impose it and then help them formulate a plan that is consistent with their own values. This approach avoids the

defensiveness created by a more directive style. Although not statistically significant, a pilot study demonstrated feasibility and a tendency toward reduced BMI change with this technique.[11]

Cognitive behavioral techniques. Health professionals can encourage goal setting, monitoring behaviors targeted for change, and use of positive reinforcement. Initial goals should be easily achievable, like engaging in 15 minutes of physical activity or having only one serving (generally ≤8 ounces) of a sugar-sweetened beverage each day. Parents should reinforce behavior goals rather than weight change, and reinforcement should be verbal praise or an extra privilege, but not food. Health professionals and parents should expect imperfect adherence and should focus on successes, not failures.

THE ROLE OF HEALTH PROFESSIONALS

The health professional's office system can enhance efforts to address obesity prevention consistently through the following practices:

- Routine documentation of BMI for age and gender. This practice will improve timely recognition of early mild obesity that may be more amenable to intervention.
- Establishment of procedures to deliver obesity prevention messages to all children and adolescents. When the child's or adolescent's individual risk of obesity is low, these messages can promote appropriate general health or wellness rather than weight control. Simple, memorable guidelines, presented early and repeated regularly and supported with posters and handouts, can be delivered efficiently in the office and are likely to be effective teaching tools.
- Establishment of procedures to address children and adolescents who are overweight (85th–94th percentile BMI) and obese (≥95th percentile BMI). For instance, when a child or adolescent is overweight, a health professional may plan to review family history, child's or adolescent's blood pressure and cholesterol, and BMI percentile over time, then assess health risk based on that information. Offices should flag charts of overweight and obese children and adolescents so that all health professionals at all visits are aware and can monitor growth, risk factors, and social-emotional issues.
- Involvement and training of interdisciplinary teams, including nurses, physicians, and administrative staff, in their respective responsibilities and skills.
- Chart audits to establish baseline practices, help set goals for practice improvement, and then measure the improvement over time.

TREATMENT

The primary goal of obesity treatment is improvement of long-term physical and psychosocial health through permanent healthy lifestyle habits and changes to the environment where the child or adolescent lives.[12] For some children and adolescents, implementation of these habits alone will lead to improved weight (weight loss or weight maintenance during linear growth), but other children and adolescents may need additional focused efforts to achieve negative energy balance. Others may need additional help with behavior modification strategies to develop and sustain healthy habits. Emotional health (good self-esteem and an appropriate attitude toward food and body) is also an important outcome. To achieve these goals, it has been recommended that health professionals present a staged approach with 4 treatment stages of increasing intensity.[12] Patients can begin at the least intense stage and advance depending on response to treatment, age, degree of obesity, health risks, and motivation.

Table 1 presents the 4 stages and includes both the intervention strategies (what behavior changes to recommend) and the process for providing the intervention (how to offer an intervention to a family, in terms of location, staffing, and support.)

Stage 1: Prevention Plus. As a first step, overweight and obese children or adolescents and their families can focus on basic healthy lifestyle eating and activity habits that form the obesity prevention strategies. However, the outcome is improved BMI status rather than maintained healthy BMI, and the health professional offers more frequent monitoring to motivated patients and families.

TABLE 1. STAGED APPROACH FOR TREATMENT OF CHILDHOOD AND ADOLESCENT OBESITY[a]

Stage	What: Recommended Behaviors for Child/ Adolescent and Family	How: Setting and Staff for Intervention	When
Stage 1: Prevention Plus	5+ fruits and vegetables <2 hours/day screen time ≥1 hour/day physical activity Reduce/eliminate sugar-sweetened beverages Eating behaviors (eg, 3 meals a day, family meals, limit eating out) Family-based change	Office-based Trained office support (eg, physician, pediatric nurse practitioner, nurse, physician assistant) Scheduled follow-up visits	Frequency of visits based on readiness to change/behavioral counseling Reevaluate in 3–6 months Advance to next level depending on response and interest
Stage 2: Structured Weight Management	Develop plan for family and/or adolescent to include More structure (timing and content) of daily meals and snacks Balanced macronutrient diet Reduced screen time to <1 hour/day Increased time spent in physical activity Monitoring taught to improve success (eg, logs of screen time, physical activity, dietary intake, or dietary patterns)	Office-based (registered dietitian, physician, nurse) trained in Assessment techniques Motivational interviewing/behavioral counseling Teaching parenting skills and managing family conflict Food planning Physical activity counseling Support from referrals	Monthly visits tailored to child/ adolescent and family Advance if needed or if no improvement after 3–6 months (improvement = weight maintenance or BMI deflection downward)
Stage 3: Comprehensive Multidisciplinary Intervention	Structured behavioral program (eg, food monitoring, goal-setting contingency management) Improved home food environment Structured dietary and physical activity interventions designed to result in negative energy balance Strong parental/family involvement especially age <12 years	Multidisciplinary team (includes dietitian and counselor or behavioralist, with medical oversight) Dedicated pediatric weight management program or dietitian and behavioral counselor plus structured activity program	Weekly for 8–12 weeks, then monthly If no improvement after 6 months (improvement = weight loss or BMI deflection downward) Ages 2–5 years remain in stage 3 with continued support Ages 6–11 years if >99th percentile[b] and a comorbidity, consider stage 4 Ages 12–18 years if >99th percentile[b] with a comorbidity or with >6 months of no weight loss in stage 3, consider stage 4
Stage 4: Tertiary Care Intervention	Continued diet and activity behavioral counseling plus consider more aggressive approaches, such as medication, surgery, or meal replacement	Pediatric weight management center operating under established protocols Multidisciplinary team	According to protocol

Abbreviations: BMI, body mass index; NHANES, National Health and Nutrition Examination Surveys.

[a]Adapted, with permission, from: Barlow et al.[6]

[b]There is not consensus on a definition of severe obesity. The expert committee suggested use of 99th percentile based on cutpoints defined by Freedman et al[7] from NHANES data. These cutpoints may be imprecise, but children and adolescents with BMI at or above this level have higher medical risk and therefore intervention is more urgent.

Stage 2: Structured Weight Management. This level of obesity treatment is distinguished from Prevention Plus less by differences in the targeted behaviors and more by the support and structure provided to the child or adolescent to achieve those behaviors.

Stage 3: Comprehensive Multidisciplinary Intervention. This approach increases the intensity of behavior changes, frequency of visits, and specialists involved to maximize support for behavior change. Generally, this type of program will exceed the capacity of a primary care office to offer within the typical visit structure. However, an office or several offices could organize specialists to offer this kind of a program.

Stage 4: Tertiary Care Intervention. The intensive interventions in this category, such as medications, surgery, and meal replacements, may be considered for some severely obese adolescents. These interventions move beyond the goal of balanced, healthy eating and activity habits that are the core of the other stages. Candidates for consideration will have attempted weight control in the Comprehensive Multidisciplinary Intervention stage, have the maturity to understand possible risks, and be willing to maintain physical activity and, if consistent with the additional intervention, a healthy diet with appropriate behavior monitoring. However, lack of success with the Comprehensive Multidisciplinary Intervention is not by itself an indication to move to this level of treatment.

The metric for improved weight is BMI percentile, generally to below the 85th percentile, although some children and adolescents will be healthy in the overweight category (85th–94th percentile). Although improvement in BMI percentile is the goal, serial weights can reflect energy balance in the short term. Weight maintenance leads to reduction in absolute BMI because of ongoing linear growth, and even slow weight gain can result in lower BMI percentile because BMI for a given percentile curve rises with age. In general, younger and more mildly obese children should change weight more gradually than older, severely obese adolescents. Table 2 summarizes recommendations for weight change targets for children and adolescents in obesity treatment.

Ages 2 years and younger: Caloric restrictions designed to reduce weight are not recommended in this age group. However, health professionals should discuss the potential long-term risk and encourage parents to establish obesity prevention strategies.

TABLE 2. WEIGHT TARGETS FOR CHILDREN AND ADOLESCENTS TREATED FOR OBESITY[a,b]

Ages, y	BMI 5th–84th Percentile	BMI 85th–94th Percentile	BMI 95th–98th Percentile	BMI ≥99th Percentile[c]
2–5	Maintain growth velocity.	Weight maintenance or BMI trending downward	Weight maintenance or BMI trending downward	Very high BMI (rare) if BMI >21 gradual weight loss of not >1 lb/month until BMI <98th percentile[d]
6–11	Maintain growth velocity.	Weight maintenance or BMI trending downward	Gradual weight loss not more than 1 lb/month[d]	Weight loss maximum of an average of 2 lbs per week[d]
12–18	Maintain growth velocity until linear growth complete.	Weight maintenance or BMI trending downward	Weight loss of a maximum of an average of 2 lbs per week[d]	Weight loss maximum of an average of 2 lbs per week[d]

Abbreviations: BMI, body mass index, NHANES, National Health and Nutrition Examination Surveys.
[a]Adapted, with permission, from: Barlow et al.[6]
[b]These targets apply to children and adolescents who need to improve weight. Some children and adolescents who are in (or just above) the 85th percentile to 94th percentile category are unlikely to have excess body fat and should receive usual obesity prevention counseling without a goal of lower BMI percentile.
[c]There is not consensus on a definition of severe obesity. The expert committee suggested use of the 99th percentile based on cutpoints defined by Freedman et al[7] using NHANES data. These cutpoints may be imprecise, but children and adolescents with BMI at or above this level have higher medical risk and therefore intervention is more urgent.
[d]Excessive weight loss should be evaluated for high-risk behaviors.

CONCLUSION

Health professionals have the potential to improve outcomes by early identification, helping individual families create the best possible home environment, encouraging parents to be good role models for healthy eating and physical activity, and providing more structured guidance to overweight and obese children and adolescents and their families.

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Oral Health

Good oral health can be defined as having a functionally sound mouth and jaw that are free of disease. Maintaining good oral health requires a healthy body and healthy behaviors, including eating habits. Nutrition and oral health go hand in hand; adequate nutrition is necessary for the development, maintenance, and integrity of oral tissues, and the ability to chew is important for maintaining healthy eating habits and sound nutrition status.[1] Both maintaining healthy eating and sound nutrition status play important roles in helping to prevent oral diseases, including dental caries (tooth decay) and periodontal diseases—the 2 types of oral infections that account for most tooth loss.[2]

Although mastication can cause the release of low levels of mercury vapor from dental amalgam filling material, the US Food and Drug Administration concluded that dental amalgam does not cause adverse health effects in humans including sensitive subpopulations (ie, infants, children, pregnant women). These conclusions were based on published peer-reviewed literature and reviews by the Agency for Toxic Substances and Disease Registry and the Environmental Protection Agency.[3]

SIGNIFICANCE

Dental caries and periodontal diseases are among the most common diseases affecting children and adolescents. The report, *Oral Health in America: A Report of the Surgeon General,* states that approximately 52% of children ages 5 to 9 are affected by dental caries, and the disease becomes even more prevalent as children get older.[4] More than 70% of children older than age 7 are affected by gingivitis.[5,6] Untreated gingivitis can progress to periodontitis, a serious infection that results in irreversible destruction of the tissues of the periodontium, and eventually may cause tooth loss. Both dental caries and periodontal diseases are preventable and can be addressed through oral health and nutrition education.

Foods that promote dental caries and plaque formation include those high in sucrose, fructose, and glucose, such as candy, cookies, cake, sweetened beverages, and dried fruit. Such items are cariogenic because they contain fermentable carbohydrates. These sugars are metabolized by oral bacteria, producing acids that cause a decrease in dental plaque pH. A drop in plaque pH below 5.5 causes demineralization or loss of the tooth's mineral structure.[7] Caries activity is strongly influenced by the retentiveness and frequent consumption (ie, more than 4 times a day) of fermentable carbohydrates. Consuming foods such as plain milk, cheese, meats, legumes, and raw vegetables can reduce the risk of caries, and their consumption fosters systemic health as well.[7,8]

Complex carbohydrates such as whole grains deter plaque formation and stimulate salivary flow, which facilitates dental and periodontal health. Maintaining a healthy periodontium requires a healthy immune system supported by a healthy diet. Nutrient

deficiencies have been shown to result in decreased resistance to periodontal infections, weakened periodontal structures, and diminished wound healing.[9]

SCREENING AND ASSESSMENT

A generation ago, the role of nutrition in oral health was thought to be limited to the relationship between simple sugars and dental caries. Anticipatory guidance for dental caries prevention meant advising individuals to decrease the frequency of simple sugar consumption. Today, nutrition screening and assessment in the context of oral health focuses on risk assessment and referral to a registered dietitian for infants, children, and adolescents who present with significant dietary inadequacies.

Risk assessment allows the oral health professional to tailor health supervision to the infant's, child's, or adolescent's level of risk for specific diseases, conditions, and injuries. The assessment consists of (1) an interview to identify risk and protective factors for oral disease and (2) an analysis of these factors to establish a health supervision plan that includes age-appropriate anticipatory guidance and recommendations on the type and frequency of visits needed.

Bright Futures in Practice: Oral Health[10] discusses risk assessment and provides guidelines on risk factors for infants, children, and adolescents and on factors that are most common at a particular age. A pediatric dental nutrition risk assessment tool can be very helpful to the oral health professional in identifying specific oral health and dietary risk factors (Figure 1). The oral health professional should address the risk factors with the child's parent/caregiver and provide appropriate oral health and nutrition education. Nutritional counseling should be provided for those patients at high risk.[11] The child or adolescent should be referred to a registered dietitian if notable deficiencies are evident.

FIGURE 1. DENTAL NUTRITION RISK ASSESSMENT[a]

Questions for a child's parent/caregiver

Has your child ever had any cavities or fillings?
- Enter 1 for yes _____
- Enter 0 for no _____

Have any of the child's brothers or sisters ever had cavities or fillings?
- Enter 1 for yes _____
- Enter 0 for no _____

How often does your child brush his/her teeth?
- Enter 0 for at least twice a day _____
- Enter 1 for once a day _____
- Enter 2 for never or less than once a day _____

Does your child use fluoride toothpaste?
- Enter 0 for yes _____
- Enter 1 for no _____

How often does your child floss?
- Enter 0 for every day or most days _____
- Enter 1 for at least once a week, but not daily _____
- Enter 2 for never/rarely (less than once a week) _____

Does your child take any sugar-containing medications or vitamins on a regular basis?
- Enter 0 for yes _____
- Enter 1 for no _____

How many snacks does your child eat per day?
- Enter 0 for 0, 1, or 2 snacks _____
- Enter 1 for 3 snacks _____
- Enter 2 for more than 3 snacks _____
- Enter 3 for constant snacking _____

Which best describes when your child eats sweets?
- Enter 0 for with meals _____
- Enter 1 for at the end of meals _____
- Enter 2 for with or as snacks _____
- Enter 3 for never _____

FIGURE 1. DENTAL NUTRITION RISK ASSESSMENT[a], continued

How often does your child snack before bedtime?
- Enter 0 for never _____
- Enter 1 for occasionally _____
- Enter 2 for often _____

How often does your child eat slowly dissolving candies and/or lozenges?
- Enter 0 for never/rarely _____
- Enter 1 for often _____
- Enter 2 for once a day _____
- Enter 3 for more than once a day _____

Does your child chew sugar-free gum?
- Enter 0 for yes _____
- Enter 1 for no _____

How often does your child drink fruit juice, soda, or other carbonated beverages?
- Enter 0 for never/rarely _____
- Enter 1 for often, but not every day _____
- Enter 2 for daily, one or more consumed fast _____
- Enter 3 for daily, one or more sipped slowly _____

If end score was _____
- 9 or higher: Very high risk. Needs nutrition counseling
- 4–8: Moderate risk. Will probably benefit from instructions and handout.
- 0–3: Low risk. Will probably benefit from review of basic instructions and handout.

[a]Source: Harper and Faine.[11]

ANTICIPATORY GUIDANCE

For children with dental caries, anticipatory guidance should address the frequency, consistency, and amount of cariogenic foods consumed. Children and adolescents with dental caries should be advised to (a) choose nutrient-dense foods (ie, those with many vitamins, minerals, fiber, and other nutrients, but that are lower in calories than other foods of comparable nutritional value) that deter plaque formation and stimulate salivary flow, (b) eat snacks in moderation, (c) consume cariogenic foods with meals only, (d) decrease frequency of sugar consumption, and (e) consume less than 10% of daily calories from sugar.[7,12]

Dietary recommendations for children and adolescents with periodontal disease (eg, gingivitis, periodontitis) are less specific than are dietary recommendations for those with dental caries, because periodontal diseases are more complex and can take years to emerge. Anticipatory guidance for children and adolescents with periodontal diseases should stress eating foods that maintain the integrity of the gums and bones, support immunity and healing, and minimize plaque accumulation.[9,13] Such foods would include low-sugar, fibrous, and nutrient-dense items, such as orange slices, carrot sticks, cheese and whole-grain crackers, and milk and unsweetened whole-grain cereals.

Although these recommendations apply to all infants, children, and adolescents, some recommendations are age-specific. Health professionals can use the following information to provide anticipatory guidance to infants, children, adolescents, and their parents.

PRENATAL

Good maternal nutrition during pregnancy supports normal enamel development in the infant's primary teeth as well as salivary gland development and function. Although the effects of marginal deficiencies are unknown, extreme nutrient deficiencies in the pregnant woman can lead to malformed teeth and altered salivary flow in the infant.[1,14] Ingesting fluoride during pregnancy does not protect the fetus against future dental caries,[15] but fluoride use and good oral hygiene can reduce a pregnant woman's levels of caries-causing bacteria.[16]

To reduce the infant's risk of inoculation with cariogenic bacteria, health professionals should advise parents not to share food or utensils with the infant and not to clean pacifiers by

placing the pacifiers in their own mouths, since cariogenic bacteria are often transmitted via these routes.[17] Health professionals should also encourage parents to receive regular preventive oral health care, since active dental caries harbor high levels of cariogenic bacteria.[18]

INFANCY AND EARLY CHILDHOOD

When infants are 6 months old, the adequacy and method of fluoride intake should be addressed.[19] Systemic fluoride—which is ingested through fluoridated water or fluoride supplements—becomes very important because of its long-term benefits. The amount of fluoride the infant is ingesting needs to be determined via assessment of the water source (community water, bottled water, or well water) and the feeding method (breastfeeding or bottle-feeding). The local health department can determine the amount of fluoride in community water and a laboratory test can determine the amount of fluoride in well water. If parents use infant formula that is reconstituted from powder or concentrate and the child is taking a fluoride supplement, the formula should be mixed with non-fluoridated water to avoid overexposing developing teeth to fluoride. The child's dentist should determine the appropriate combination of fluoride therapies.

Dental caries can occur at any age after the teeth erupt. Particularly damaging forms can begin early, when developing primary teeth are especially vulnerable. This type of dental caries is known as early childhood caries (ECC). Early childhood caries is defined as the presence of one or more decayed (non-cavitated or cavitated lesions), missing (due to caries), or filled tooth surfaces in any primary tooth in a child between birth and 71 months of age.[18]

The etiology of ECC is mulfactorial. Important contributing factors include excessive and inappropriate use of a bottle containing cariogenic liquids and transitional methods of feeding (eg, sippy cup to cup).[20] To reduce the risk of ECC, infants and children should not be put to bed with a bottle or be allowed to drink from a bottle at will during the day. Sucking on a bottle containing beverages high in sugar (eg, fruit drinks, soda, fruit juice) for a prolonged period can contribute to dental caries.

Frequent consumption (ie, more than 4 times a day) of sugar or sweetened foods is associated with the development of dental caries in the first 3 years of life and can be a predictor of caries activity in later years.[12]

For children in child care programs, nutrition-related oral health issues include frequent consumption of fermentable carbohydrates as well as the fluoride level in their drinking water. Nutrition safety concerns include fluoride toxicity (poisoning and fluorosis);[21] food allergies (eg, peanut allergies);[22] and the potential for choking on foods such as peanuts, peas, beans, grapes, and hotdogs.[23]

MIDDLE CHILDHOOD AND ADOLESCENCE

Children's and adolescents' access to snacks containing fermentable carbohydrates, their snacking patterns, their freedom to choose foods outside the home, and their increasing energy needs are nutrition-related oral health issues. Children's and adolescents' consumption of their school's drinking water and bottled or processed water needs to be considered when evaluating the adequacy of their fluoride ingestion.

The type and frequency of snacks that children and adolescents consume remain a concern. Dietary fads such as sport drinks, so-called functional drinks (eg, energy drinks and vitamin waters), and fruit drinks can compromise nutrition and oral health status (ie, decalcify teeth).

Carbonated beverages also present a risk, owing to their high sugar content and acidic pH. On average, the sugar content of a can of non-diet soda is 40 g (10 teaspoons). It is recommended that children and adolescents consume less than 40 g of sucrose per day to decrease the risk of caries.[7] Beverages represent a significant concern, since many children and adolescents consume multiple servings per day.[24] Carbonated beverages and sport drinks also contribute to dental erosion (loss of tooth structure from demineralization) owing to their acidic pH levels, which range from 2.92 to 4.61.[25] Such levels are well below the decalcification point of 5.5. Erosion can occur even in a caries-free oral cavity, simply as a result of the high acidity of a food. In addition, low-nutrient beverages often displace milk in children's or adolescents' diets, increasing

the risk for calcium and vitamin D deficiencies. Such deficiencies can have long-term detrimental effects.[23,24]

Purging types of eating disorders, such as bulimia nervosa, can also expose the oral tissues to an acidic pH. Vomiting is a common form of purging that can cause dental erosion because of the frequent exposure of teeth to acidic gastric contents. Dental erosion in children or adolescents with eating disorders can be severe, contributing to tooth sensitivity, tooth loss, or both.[26] Due to the serious oral and systemic health risks associated with eating disorders, early intervention and treatment is imperative.[27] (See the Eating Disorders chapter.)

INFANTS, CHILDREN, AND ADOLESCENTS WITH SPECIAL HEALTH CARE NEEDS

Many diseases and conditions can affect the nutrition and oral health status of infants, children, and adolescents with special health care needs. Owing to an increased risk for oral diseases, it is especially important that they receive regular oral health care. Following are some oral health implications associated with specific nutrition-related physical conditions:

- Infants born preterm with a low–birth weight can exhibit oral and dental malformations.[28]
- Children and adolescents with special health care needs can require diets high in carbohydrates, which may increase the risk for dental caries. The frequency of carbohydrate feeding may also accelerate the development of dental caries.
- Children and adolescents who are fed through gastrostomy tubes can still develop calcified deposits on their teeth, which may lead to chronic inflammation in the mouth.[29]
- Children and adolescents with gastric reflux can have enamel erosion similar to that seen with bulimia nervosa.[30]
- Children and adolescents who have difficulty chewing and swallowing may leave more food on their teeth, which can increase plaque formation and the risk of decalcification.
- Children and adolescents with celiac disease may be at increased risk for tooth malformation.[31]
- Children and adolescents undergoing radiation and chemotherapy are at increased risk for oral disease.[32]
- Children with special needs (ie, cerebral palsy, attention-deficit/hyperactivity disorder, and Down syndrome) are at increased risk for bruxism. Chronic wearing of the crowns of the teeth can cause difficulty chewing certain foods, which can increase a child's risk for malnutrition.[1,33–36]
- Children with special health care needs often suffer from malocclusion, which can cause difficulty chewing raw, fibrous foods. Chronic consumption of a soft diet can cause malnutrition, since it may be inadequate in calories, nutrients, and fiber.[1,37]
- Gingival overgrowth is a common side effect of certain medications (eg, dilantin, cyclosporine, and calcium channel blockers). Gingival overgrowth can cause difficulty chewing, resulting in insufficient intake of calories, nutrients, and fiber.[18]
- Long-term use of bottles or sippy cups filled with high-sugar beverages increase a child's risk of dental caries.[18]
- Frequent use of syrup-based medicine represents a primary risk factor for ECC.[35]
- Certain drug treatments (eg, psychotropic medications) can cause xerostomia (dry mouth), which increases the risk for dental caries.[1,35]
- High-sugar foods and/or beverages used to calm or soothe a child increase a child's risk of dental caries.[38]

OTHER SPECIAL CONSIDERATIONS

VITAMIN DEFICIENCIES

Protein and calorie malnutrition and deficiencies in calcium and phosphorus and vitamins A, C, and D contribute to defects in enamel formation.[14,39] Salivary gland hypofunction and altered salivary composition are associated with malnutrition as well, and they increase the risk for dental caries.[14] Malnutrition also depresses the body's immune response, increasing the risk for periodontal infection,[9] and select nutrient deficiencies (ie, vitamin C) increase the permeability of the sulcular epithelium, which further increases the risk of infection.[9,40] Deficiencies of select B vitamins (ie, B_1, B_2, B_6, B_{12}, biotin, folate, niacin) lead to inflammation in the mouth, corners of the lips, and tongue. Vitamin C deficiency

causes scurvy and, if untreated, leads to a breakdown of the gums and bones and eventual death. Rectifying these deficiencies will reverse damage done to soft tissues and prevent further damage to teeth.[39,40]

FLUORIDE

Although many community water supplies are still not fluoridated, the relatively widespread availability of fluoridated water is primarily responsible for the reduced prevalence of dental caries among children and adolescents during the last several generations.[41] Fluoride increases the resistance of teeth to demineralization, encourages the healing of nascent caries, and reduces plaque formation.[18]

Infants, children, and adolescents can receive fluoride systemically, topically, or both ways. Systemic fluorides include fluoridated water and fluoride supplements (drops, liquids, and tablets). Children who drink fluoridated water benefit because fluoride is incorporated into their developing teeth. Although the contribution of systemic fluoride in developing teeth is believed to play a minor role in caries prevention, it does provide a topical effect for children and adolescents whose teeth are fully erupted. Topical fluorides (those applied to the surfaces of the teeth) are most effective when delivered at low doses many times a day. Topical fluorides include fluoridated water, over-the-counter fluoride rinses, professionally applied fluoride treatments, and fluoride-containing toothpaste.[42] Almost all toothpaste manufactured in the United States provides topical fluoride. Toothpastes with the American Dental Association seal of acceptance ensure an optimal level of fluoride.[43] Children younger than 6 years should be supervised when brushing to help reduce the risk of swallowing toothpaste. Fluoridated mouth rinse should not be used by children younger than 6 years due to the risk of swallowing.[44] Fluoridated water and toothpaste are recommended for all children irrespective of their caries risk and are considered a therapeutic baseline for children.

An oral health professional or physician should determine the appropriate fluoride program for each infant, child, or adolescent based on age, history of and susceptibility to dental caries, and current fluoride level.[42] It is not sufficient for health professionals to ask families whether they live in a community where the water is fluoridated; rather, it is more appropriate to ask about the source of their drinking and cooking water. If the water is bottled or processed, it must be assessed to determine its fluoride level. Many children and adolescents spend a great deal of time outside the home and drink water that comes from a variety of sources. Fluoride supplements should be prescribed only for children and adolescents who are at high risk of developing dental caries and whose primary source of drinking water is deficient in fluoride.[45] Table 1 indicates the recommended dosage of system fluoride supplement relative to the fluoride level in drinking water and the child's or adolescent's age.

TABLE 1. SYSTEMIC FLUORIDE SUPPLEMENTS: RECOMMENDED DOSAGE[a]

	Fluoride Ion Level in Drinking Water[b]		
Age	**<0.3 ppm**	**0.3–0.6 ppm**	**>0.6 ppm**
Newborn–6 months	None	None	None
6 months–3 years	0.25 mg/day[c]	None	None
3–6 years	0.50 mg/day	0.25 mg/day	None
6–16 years	1.0 mg/day	0.50 mg/day	None

[a] Source: American Dental Association.[46]
[b] 1.0 ppm = 1 mg/L.
[c] 2.2 mg of sodium fluoride contains 1 mg of fluoride ion.

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Pediatric Undernutrition

Pediatric undernutrition (sometimes also referred to as failure to thrive) is typically diagnosed in the first 2 years of life. Health professionals can often identify pediatric undernutrition by the time a child is 1 year old. By carefully monitoring the child's growth on a standard growth chart,[1] health professionals can recognize the condition when a child's weight for age, length for age, weight for length, or weight for height decreases across percentiles or falls below the fifth percentile, a z-score of -2, or when the child's weight does not increase after a few months.[2] Some children have normal growth parameters but a declining overall growth pattern. All of these children warrant further assessment for pediatric undernutrition.

SIGNIFICANCE

Pediatric undernutrition may impair a child's growth and development. The condition is also associated with diminished immunologic resistance and decreased physical activity. In addition, it can lead to long-term problems with cognitive development, academic performance, and socio-affective competence.[2] These effects are of greater concern if undernutrition is severe or if it occurs during infancy, when brain growth is most rapid. However, undernourished infants and children can benefit at any age from interventions that include improved nutrition.

ASSESSMENT

Pediatric undernutrition is caused by nutritional inadequacy. It occurs when infants or children either are not offered foods that contain adequate energy and nutrients, do not take these foods when offered, or do not retain the energy and nutrients that these foods contain. The condition often originates from a combination of biological, developmental, behavioral, economic, cultural, and psychosocial factors. When assessing children for pediatric undernutrition, it is important for health professionals to consider multiple factors. This requires working closely with families and may mean devoting extra time to understanding the causes of the problem.

BIOLOGICAL AND DEVELOPMENTAL FACTORS

Several biological and developmental factors may contribute to pediatric undernutrition. Health professionals should be aware of these when assessing an infant or young child.

Infants born prematurely, especially those born small for gestational age, are likely to remain short in stature and to weigh less than their peers as they get older. These children may have special nutritional requirements that need to be met to ensure that they grow and develop at their full potential. Special growth charts are available to monitor the growth of children born prematurely.

A diagnosis of inadequate growth may derive from familial patterns of normal growth (eg, parents who are short or thin, or who experienced delayed growth and sexual maturation).[3] Inadequate growth may also result from common medical conditions (eg, otitis media, diarrhea, gastroeseophageal reflux) or from a variety of uncommon medical conditions (eg, cystic fibrosis, congenital heart disease), most of which can be identified during a careful medical history and physical examination. In children with chronic diarrhea, it is helpful to obtain a dietary history, including the volume of fruit juice consumed. Some cases of pediatric undernutrition have been associated with excessive intake of juice.[4]

Some infants and children are difficult to feed and may not eat sufficient quantities of nutritious foods, even though food is offered to them in an appropriate manner. This situation can be challenging, frustrating, and worrisome for parents. The child's difficulties may be manifested by gagging, excessive drooling, coughing, choking, and other symptoms and may require help from an occupational therapist or speech-language pathologist.[5] In addition to undernutrition, some children have delays in speech and language or other aspects of development and should be referred to early intervention programs.

NUTRITIONAL FACTORS

Food choices, feeding practices, or both may contribute to pediatric undernutrition. Therefore, assessment of these choices and practices is integral to assessing pediatric undernutrition. The assessment includes gathering information about the mother's diet, whether the infant is breastfed or formula fed, the infant's or child's feeding schedule, formula preparation, parents' knowledge and health beliefs, and food availability.

Asking parents to keep a 3-day food record or obtaining a 24-hour food recall can help health professionals determine whether the child's food intake contains sufficient energy, protein, and fat to sustain growth and development.[4] Such food records can also help health professionals learn about the frequency and regularity of the infant's or child's feedings.

BEHAVIORAL FACTORS

It is important to obtain information from parents about the location of feedings, mealtime atmosphere, whether there are multiple caregivers, and how responsive parents and caregivers are to the needs and cues of the infant or child. Asking parents to describe a typical day may provide a good introduction to those issues.

It is often very helpful for health professionals to observe parents' interaction with the infant or child during feedings. Home visits by a registered dietitian, nurse, or other health professional are even more helpful and can help improve understanding of the family's lifestyle and enhance health professionals' ability to advise parents.[3]

Common problems with food choices and feeding practices include the following:

- Over-diluting infant formula
- Adding large quantities of cereal or other foods to the bottle
- Providing foods that are not appropriate textures for the infant's or child's age and developmental stage
- Providing 2% rather than whole milk for children younger than age 2
- Providing excessive amounts of fluids that have little nutritional value (eg, fruit-flavored drinks, sweetened beverages)
- Feeding infrequently or inconsistently
- Not providing a high chair
- Feeding in the presence of distractions or in a chaotic household with multiple caregivers

Toddlers seeking autonomy may refuse to be fed but may eat well if parents provide the food and let the child do the eating. For more information about appropriate feeding and eating behaviors, see the Infancy and Early Childhood chapters.

ECONOMIC FACTORS

Pediatric undernutrition can result when families do not have enough money and other resources (eg, transportation) to obtain sufficient food.[3] Health professionals can refer parents to federal food assistance and nutrition programs that can provide a substantial part of an infant's or child's daily nutrition requirements. (See Tool K: Federal Nutrition Assistance Programs.) Food shelves and pantries, churches and other places of worship, and businesses can be additional sources of food and support.

CULTURAL FACTORS

When health professionals are interviewing and counseling parents of an infant or child with pediatric undernutrition, they must keep in mind that cultural beliefs affect many aspects of infant and early childhood nutrition (eg, breastfeeding and weaning, expectations about the child's weight, food preferences, and responding to the child's independence and need to self-feed). Health professionals need to listen attentively, become aware of their own assumptions, and be open to the practices of those from cultures other than their own. They can also improve their ability to advise parents by being sensitive to cultural differences in professional-parent relationships, learning to negotiate culturally based disagreements, and learning new languages or using interpreters.[6] (For further information about culture and food choices, see the Cultural Awareness in Nutrition Services chapter.)

PSYCHOSOCIAL FACTORS

Psychological issues, maternal depression, family stressors, or a disturbance in the parent-child relationship may affect a child's nutrition. In addition, parents whose child is not growing as expected may experience high levels of anxiety, and the health professional may find it hard to work with the family. In these instances, consultation with a mental health professional may be important. If parents fail to follow through with recommendations and the health professional suspects neglect, it may be necessary to contact child protective services.

TREATMENT AND MANAGEMENT

Nutritional treatment for pediatric undernutrition includes making appropriate adjustments to the infant's or child's feeding or eating practices to achieve optimal nutrition. This may include increasing the energy density of the foods that the infant or child receives, with the amount of energy continuing to increase until appropriate growth is achieved. A multivitamin and a zinc supplement may also be recommended. Iron deficiency should be treated if present. (See the Iron-Deficiency Anemia chapter.)

Topics for anticipatory guidance with parents may include

- Normal growth and development
- Formula preparation
- Feeding techniques
- Establishing a schedule for feeding
- Limiting sweetened beverages and fruit juice
- Developing realistic and achievable goals
- Addressing any behavioral issues related to feeding
- Toddlers' wish for autonomy

Suggestions for parents include decreasing distractions during feeding, having the infant or child sit in a designated place for feedings, offering approximately 3 meals and 2 snacks a day, and increasing the energy density of the foods offered.

Goals of treatment and management of pediatric undernutrition include

- Achieving food choices appropriate for the child's age and developmental stage
- Achieving appropriate feeding or eating behavior for the child and the parents so that all of them enjoy meals
- Improving growth, so that infants rise across percentiles (catch-up growth) and toddlers at least parallel the growth chart upward
- Achieving normal social-emotional, language, and cognitive development

Medical and nutritional follow-up include obtaining and monitoring growth measurements, assessing catch-up growth adequacy, modifying

the nutrition care plan as needed, and reinforcing anticipatory guidance provided to parents. Any underlying medical issues need further treatment and follow-up as well.

Because multiple factors can come into play with pediatric undernutrition, several professionals, including dietitians, nurses, physicians, mental health and other health professionals, child care providers, and child development specialists may need to work as a team in assessing and treating the child.[4] These professionals must work closely with one another and with the family to gather and share information, plan effective interventions, identify areas where more help is needed, and work to coordinate services. Coordination among multiple agencies may be a challenge.

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Vegetarian Eating Practices

Vegetarian eating practices are chosen for religious, health, environmental, cultural, and ethical reasons. Infants and children on vegetarian diets are following their parents' eating practices, but adolescents may choose vegetarianism independently of family members.

Adolescence is a time of experimentation, and as adolescents experience cognitive changes and broaden their perspectives, they often become concerned about social and environmental issues. Adolescents tend to be attracted to vegetarian eating practices, especially during middle or late adolescence, because of their concerns about animal welfare, ecology, the environment, or personal health. Concerns about body weight also motivate some adolescents to adopt a vegetarian diet, since this is a socially acceptable way to reduce dietary fat. Vegetarian eating is often seen in adolescents with anorexia nervosa, who adopt the diet in an attempt to hide their unnecessary restrictions on food intake.

Vegetarian diets usually include at least a few foods of animal origin, most commonly milk, milk products, and eggs. Vegan diets exclude the use of animal foods of any type. Table 1 describes the different types of vegetarian eating practices.

POTENTIAL BENEFITS

Vegetarian diets often provide more fruits, vegetables, and fiber, as well as less fat and cholesterol, than mixed diets. Children and adolescents who are vegetarians may also have lower levels of blood cholesterol and body fat than nonvegetarians.

POTENTIAL RISKS

Vegetarian diets that include milk, milk products, and eggs are generally high in essential nutrients and are unlikely to pose health risks. Strict adherence to a vegan diet (which excludes all foods of animal origin) may place infants, children, and adolescents at nutrition risk. Unless specially fortified foods or supplements are added, the vegan diet lacks vitamins B_{12} and D.

Animal foods are particularly rich sources of certain nutrients needed for growth: protein, iron, calcium, zinc, vitamin B_{12}, vitamin A, and vitamin D. If animal foods are eliminated, these nutrients must be obtained from other sources to ensure good health.

Overly restricted or inappropriately selected vegetarian diets can result in significant malnutrition. In infants and children, malnutrition from insufficient intake of protein and energy (calories), failure to thrive, growth deficits, rickets, iron-deficiency anemia,

TABLE 1. VEGETARIAN DIETS[a]	
Lacto-ovovegetarian	Includes grains, fruits, vegetables, legumes, nuts, seeds, milk, and eggs; excludes meat, poultry, and fish and other seafood.
Lactovegetarian	Includes grains, fruits, vegetables, legumes, nuts, seeds, and milk; excludes eggs, meat, poultry, and fish and other seafood.
Strict, total, or pure vegetarian	Includes grains, fruits, vegetables, legumes, nuts, and seeds; excludes all foods of animal origin.
Vegan	The term vegan is also used to describe total vegetarians. Originally this term was used to describe persons who refrained from not only eating foods of animal origin, but also using animal products such as leather. The term is often used today to denote someone who excludes all animal products from his or her diet without implication regarding their use of other types of animal products.
Semivegetarian	Includes grains, fruits, vegetables, nuts, seeds, milk, and eggs; usually excludes red meat, but may include small amounts of fish or fowl on limited occasions.
Macrobiotic	Emphasizes whole grains and vegetables, including beans and sea vegetables (seaweeds). Uses only locally grown fruits. Foods of animal origin are limited to small amounts of white meat or fish once or twice a week. This diet may be similar to a vegan diet in its nutritional profile.

[a]Reprinted, with permission, from: Table 4.1, Johnson and Haddad.[1]

and vitamin B_{12} deficiency have been reported. Infants consuming a macrobiotic diet who are fed inappropriate infant formula are particularly at risk for severe nutrition problems. In adolescents, a delayed growth spurt, iron-deficiency anemia, and vitamin B_{12} deficiency have been observed.[2]

NUTRITIONAL ADEQUACY

Vegetarian diets are consistent with the *Dietary Guidelines for Americans*[3] and can meet the Dietary Reference Intakes (DRIs) for nutrients. With careful planning, vegetarian diets can provide a variety of nutrient-dense foods that promote healthy growth and development. Servings of legumes should be included first as part of the protein food group and then if additional servings are eaten, as part of the vegetable group.[4] *MyPyramid* meal patterns are appropriate for lacto-ovovegetarians. In addition, other meal patterns for children and adolescents who are vegetarians or vegans have been suggested.[5,6] Although slower growth rates have been reported in infants and children who followed vegan and macrobiotic diets during the first 5 years of life, "catch-up" growth usually occurred in these children by age.[10] In adolescents who are vegetarians, menarche has been observed at a slightly later age, which may be related to a lower percentage of body fat.[2]

ENERGY

Adequate food intake, which supplies energy from sources of carbohydrates, protein, and fats, is essential for growth, development, and activity. Decreased energy (caloric) intake may occur if food choices are excessively low in dietary fat and excessively high in fiber (eg, bran, raw fruits and vegetables). For those children and adolescents whose fiber intake is high, peeling fruits; sieving vegetables, cereals, or legumes; and replacing some whole grains with refined grains may be beneficial.

FAT

Vegetarian diets have the potential to be very low in fat. Fat should not be restricted in infants and children younger than 2 years and should not be overly restricted in older children and adolescents. Efforts should be made to ensure that children and adolescents consume enough fats by incorporating oils, avocado, seeds, nuts, or nut butters into their diets.

For optimal health, it is also important to have a balanced intake of omega-6 and omega-3 fatty acids. Vegetarian diets tend to be rich in omega-6 linoleic acid (LA), but reduced in the omega-3 fatty acids: alpha-linolenic acid (ALA), eicosapentaenoic acid (EPA), and docosahexaenoic acid (DHA).[7] Cardiovascular disease risk, neurologic function, and inflammatory and immune disorders may be negatively impacted by low omega-3 fatty acid intake.[8] The only naturally occurring sources of DHA in vegetarian diets are eggs and seaweeds. Because the amount of DHA is limited, vegetarians must rely on conversion from ALA. The efficiency of this conversion is poor and is further reduced by excessive intake of LA. The Institute of Medicine's Food and Nutrition Board has established adequate intakes for the essential fatty acids LA and ALA; however, it assumes EPA and DHA will also be consumed.[9] For vegetarians, additional intake of ALA may be beneficial as well as limiting the amount of LA.[7] Researchers have suggested a ratio of LA to ALA of 2:1 to 4:1 for vegetarians.[8] To achieve this, high LA oils, such as corn, safflower, sunflower, soybean, and cottonseed, should be limited. These should be replaced with oils that are high in monounsaturated fats and limited amounts of high ALA oils. Ground flax, flax oil, canola oil, walnuts, and walnut oil are good sources of ALA. DHA–fortified foods and vegan nutritional supplements are also available. Infant formula fortified with DHA must be fortified with equivalent amounts of arachodonic acid to ensure optimal growth.[8]

PROTEIN

Breast milk is an ideal source of protein throughout the first 1 to 2 years of life. For infants who are not breastfed or who are partially breastfed, either commercially prepared fortified soy or modified cow's milk infant formula promotes growth and is recommended during the first year of life. At 6 to 8 months of age, foods containing higher amounts of protein should be introduced into the infant's diet. Appropriate foods are mashed legumes, lentils, and tofu as well as egg yolks, yogurt, and pureed cottage cheese for the lacto-ovovegetarian.[10]

When energy needs are adequately met through the consumption of a variety of plant foods, protein needs are also likely to be met. When energy supply is inadequate, protein will be used to meet energy needs rather than for tissue synthesis. Because infants and children have small stomach capacities, small amounts of nutrient-dense foods are recommended 5 or 6 times a day. Milk, milk products, and eggs provide high-quality protein. Soy, amaranth (grain), and quinoa (grain) have amino acid patterns similar to those of cow's milk and therefore are important protein sources.

Mixtures of plant proteins also provide balanced, complete sources of amino acids to adequately meet protein requirements. Due to differences in amino acid composition and digestibility of plant proteins, it has been suggested that protein needs of vegan children are above the DRI, ranging from an additional 30% to 35% for children ages 1 to 2 years, 20% to 30% for children ages 2 to 6 years, and 15% to 20% for those older than 6 years.[10]

Metabolic needs can be met by drawing on the body's amino acid pools if a variety of protein-containing foods are eaten throughout the day. Consuming precise combinations of plant proteins at the same meal to achieve complete proteins is not necessary.[11] However, foods containing protein in sufficient quality and quantity, or complementary proteins consumed within a few hours of one another, are recommended for infants and children younger than 2 years who are not fed breast milk or infant formula.

CALCIUM

Calcium absorption and retention may be 30% to 50% higher among vegetarians who consume moderate amounts of protein. Lacto-ovovegetarians tend to have adequate calcium intake; however, vegan diets, if not well planned, may contain insufficient calcium.

Many vegetarian foods contain moderate amounts of calcium. Nonmilk sources of calcium in vegetarian diets include calcium-fortified soy milk, calcium-fortified juice and breads, tofu processed with calcium, blackstrap molasses, sesame seeds, tahini (sesame butter), almonds and almond butter, and certain vegetables (eg, broccoli, okra, collard and mustard greens, kale, rutabaga). Calcium in plant foods that contain high amounts of oxalates (eg, spinach, Swiss chard, beet greens, rhubarb) is not well absorbed since insoluble calcium oxalate

is formed. Fermentation, roasting, and yeasting increase calcium absorption from products (eg, miso, nuts, leavened bread).[12] Calcium supplements may be necessary if dietary intake is inadequate.

VITAMIN D

In addition to calcium, adequate intake of vitamin D is essential for bone health. Although vitamin D can be produced through exposure of the skin to sunlight (20–30 minutes 2 or 3 times per week), this source of vitamin D cannot be relied on in northern climates during the winter. Dark-skinned persons require longer exposure to sunlight (30 minutes to 3 hours per day) to produce adequate amounts of vitamin D.[12] Sunscreens, smog, and sunlight exposure through glass inhibit vitamin D synthesis.

Breastfed infants and those who consume less than 1 L of fortified infant formula per day should receive 400 IU of vitamin D supplementation beginning within the first few days of life.[13] Children and adolescents can obtain vitamin D from a variety of fortified products, including soy milk, orange juice, breakfast cereals, and margarines.

VITAMIN B_{12}

An adequate intake of vitamin B_{12} is essential for growth, red blood cell maturation, and central nervous system functioning. Because of rapid growth and limited nutrient stores in infancy, infants on a vegan diet are at high risk for vitamin B_{12} deficiency, which may manifest as irritability, apathy, failure to thrive, or developmental regression. Vitamin B_{12} deficiency has been reported in breastfed infants of women on vegan diets who do not supplement their diet with vitamin B_{12}. If untreated in early stages, vitamin B_{12} deficiency can lead to serious and permanent neurologic damage.[2] High folate intake, which may occur in children and adolescents who follow a vegan diet, can mask hematologic changes associated with vitamin B_{12} deficiency, while neurologic damage progresses.

Vitamin B_{12} occurs naturally in animal products, including milk, milk products, and eggs. Although unfortified, fermented plant foods and sea vegetables may contain some vitamin B_{12}, it seems to be present in inactive forms, some of which function as antivitamins. Thus these sources of vitamin B_{12} are considered unreliable.[10]

To ensure adequate vitamin B_{12} status, breastfed infants of women who consume a vegan diet should receive a vitamin B_{12} supplement (0.4 µg/d birth–6 months and 0.5 µg from 6–12 months); if these infants are not breastfed, they should be given fortified soy infant formula. Children and adolescents who consume a vegan diet should receive a vitamin B_{12} supplement or regularly consume 1 to 2 servings of the following: breakfast cereals, textured soy protein, soy milk fortified with vitamin B_{12}, or Red Star T-6635+ nutritional yeast flakes.[10]

IRON

Iron needs increase during periods of rapid growth. Although non-heme iron in plant products, milk, milk products, and eggs has a lower absorption rate (2%–20%) than that of heme iron in meat, fish, and poultry (15%–35%), vegetarians do not have a higher incidence of iron-deficiency anemia than persons consuming a mixed diet. Iron deficiency has been reported in children fed a macrobiotic diet. To account for the decreased bioavailability of iron in a vegetarian diet, the Food and Nutrition Board increased the DRI for children 1 year and older who are vegetarians by a factor of 1.8.[14]

Ascorbic and other organic acids found in fruits and vegetables enhance iron absorption. Inhibitors of iron absorption are phytates, tannins, and calcium in milk and milk products. Processes involved in leavening and baking whole-grain bread, fermenting soy products (eg, miso, tempeh), roasting nuts, sprouting seeds, and coagulation with gluconic acid (eg, tofu) decrease phytates and enhance iron absorption.[12]

Foods high in iron (eg, fortified breakfast cereals, instant oatmeal, blackstrap molasses, legumes, tofu, dried fruits, enriched pasta, bread) should be consumed daily. Increased intakes of foods rich in iron inhibitors should be avoided.

To ensure adequate iron status, breastfed infants should receive a low-dose iron supplement at 4 months of age and continued until adequate intake is achieved through supplemental foods.[15] Infants on a vegan diet who are not breastfed should receive iron-fortified soy formula.

Children and adolescents should consume juices, fruits, and vegetables high in ascorbic acid daily with meals.

ZINC

Zinc is essential for growth and development. Infants fed breast milk or soy infant formula should receive adequate amounts of zinc. Zinc intake should be assessed and if determined to be inadequate, a supplement or zinc-fortified foods used when complementary foods are introduced.[14] Milk and eggs are good sources of zinc in lactovegetarian and lacto-ovovegetarian diets. Plant sources of zinc include legumes, tofu, miso, tempeh, nuts, seeds, wheat germ, and whole grains.[12]

To increase the bioavailability of zinc and ensure adequate zinc intake, raw wheat bran should be avoided and the consumption of unleavened bread limited. Legumes should be soaked 1 to 2 hours before cooking, and the water discarded before cooking. Yeast-leavened bread and whole grains, roasted nuts, and sprouted seeds can be used. Although the Food and Nutrition Board does not set a separate recommended daily allowance for zinc for vegetarians, it suggests that zinc intake may need to be 50% higher in those vegetarians who consume large amounts of phytate-containing grains and legumes.[15]

SCREENING AND ASSESSMENT

The nutritional adequacy of vegetarian and vegan diets can be assessed by asking a few targeted questions. Vegetarian diets vary widely, so it is important to assess precisely what foods are eaten and eliminated from the diet and what supplements are used. Infants, children, and adolescents should be plotted on the standard growth charts as part of nutrition screening and assessment.

ANTICIPATORY GUIDANCE

Vegetarian eating practices need to be carefully planned to provide enough energy, protein, calcium, iron, zinc, and vitamins B_{12} and D. The bioavailability of calcium, iron, and zinc should also be ensured. Careful planning of vegan diets is especially important because it is more difficult to meet nutrient needs from plant foods alone. Parents of infants, children, and adolescents who are vegetarians should be given information on how to plan and provide a nutritionally adequate diet.

When adolescents become vegetarians, parents are often concerned about the diet's nutritional adequacy, especially about meeting protein requirements. Parents need reassurance that a vegetarian diet can meet their adolescent's nutrition needs, and they should receive information on the principles of healthy vegetarian eating for adolescents.

The following sections contain guidelines for vegetarian eating practices for infants, children, and adolescents.

INFANCY

- Breastfeeding an infant exclusively for the first 4 to 6 months of life provides ideal nutrition and supports the best possible growth and physical development.
- If breastfeeding is discontinued before 12 months, or breastfeeding occurs fewer than 3 times a day, feed an iron-fortified infant formula.
- Avoid inappropriate substitutes for breast milk or infant formula (eg, unfortified soy milk, rice milk, almond milk, formula prepared from grains).
- Avoid cow's milk during the first year of life and reduced-fat (2%), low-fat (1%), and fat-free (skim) milk during the first 2 years.
- Avoid corn syrup or honey.
- Provide a vitamin D supplement to breastfed infants and those consuming less than 1 L of fortified infant formula beginning within the first few days of life.[13]
- Provide an iron supplement for the breastfed infant starting at 4 months of age and continuing until adequate iron intake is achieved through supplemental food sources.[16]
- Provide a vitamin B_{12} supplement to breastfed infants of mothers who consume a vegan diet.[10]
- Follow established guidelines for introduction of solid foods. Feed higher protein solid foods (eg, mashed legumes, tofu, cottage cheese, yogurt, or egg yolks) at 6 to 8 months of age.

EARLY CHILDHOOD AND MIDDLE CHILDHOOD

- Provide 3 meals and 2 to 3 snacks per day.
- Avoid bran and excessive intake of bulky foods (eg, raw fruits and vegetables).
- Encourage eating nutrient-dense foods (eg, avocado, cheese, soy cheese, hummus, nut butters, tahini, tofu).
- Provide an omega-3 fatty acid source (eg, canola oil, soy oil, tofu, soybeans, walnuts, wheat germ).
- Avoid excessive restriction of dietary fat.
- Ensure an adequate intake of calcium, zinc, iron, and vitamins B_{12} and D.

ADOLESCENCE

- Avoid skipping meals.
- Avoid excessive restriction of dietary fat.
- Limit low-nutrient snacks high in fat and sugar.
- Encourage eating healthy, nutrient-dense snacks (eg, bagels, bean burritos, hummus and pita, nachos, nuts, nut butters [almond, cashew, peanut, soy], sunflower and pumpkin seeds, tofu dogs, tofu spreads, trail mix, veggie burgers, veggie pizzas, yogurt shakes).
- Provide an omega-3 fatty acid source (eg, canola oil, soy oil, tofu, soybeans, walnuts, wheat germ).
- Ensure an adequate intake of calcium, zinc, iron, and vitamins B_{12} and D.
- Avoid inappropriate weight-loss practices.

REFERRAL

Referral to a registered dietitian is helpful in assessing dietary intake and planning healthy vegetarian diets. For infants, children, and adolescents consuming vegetarian diets, referral to a dietitian is essential if the health professional does not have training in or adequate knowledge of nutrition. (See Tool J: Nutrition Resources.)

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Nutrition Tools

TOOL A

Nutrition Questionnaire for Infants

The nutrition questionnaire for infants is a tool for parents to complete before meeting with a health professional. The questionnaire provides a useful starting point for identifying areas of nutrition concern and determining whether additional screening is needed.

When reviewing responses to the questionnaire, use the following interpretive notes to identify areas of concern and determine follow-up questions or actions. The notes are numbered according to their corresponding questions on the questionnaire.

INTERPRETIVE NOTES

1. Feeding is crucial for the development of a healthy relationship between parents and their infant. A parent's responsiveness to an infant's cues of hunger and satiation and the close physical contact during feeding facilitate healthy social and emotional development.
2. Signs of hunger include hand-to-mouth activity, rooting, pre-cry facial grimaces, fussing sounds, reaching for utensils, and crying. Signs of fullness include turning the head away from the nipple, showing interest in things other than eating, playing with food, and closing the mouth.
3. Infants should be fed breast milk or iron-fortified infant formula, even in infant cereal. If infants are weaned from breast milk before age 12 months, they should be fed iron-fortified infant formula rather than cow's milk. Cow's milk, goat's milk, and soy milk are not recommended during the first 12 months of life.
4. In establishing realistic feeding goals for infants, it is important to assess an infant's developmental readiness for eating foods with different textures as well as her self-feeding skills. Before beginning to eat from a spoon, infants should be able to hold their heads upright and move their tongues from side to side.
5. Complementary (solid) foods can be introduced between ages 4 and 6 months when the infant is developmentally ready. After the infant has accepted iron-fortified infant cereal, then pureed or soft fruits, vegetables, and meats can be offered. Only one new food should be introduced at a time; parents should wait 3 to 5 days to see how the infant tolerates the food (observe for signs of allergic reaction). There is no research to support a particular order when introducing new foods.

Between ages 6 and 12 months, infants master chewing, swallowing, and manipulation of finger foods. They begin to use cups and utensils, and while they are experimenting with new tastes and textures, their sensory and perceptual development are stimulated.

6. Juice should not be given to infants younger than 6 months. After age 6 months, serve only 100% fruit juice in a cup instead of a bottle and limit it to 4 to 6 oz per day. It should be offered in small amounts (more than 6 oz per day is excessive), because too much juice may reduce the infant's appetite for other foods and increases the risk of loose stools and diarrhea.
7. Infants permitted to suck on a bottle of any fluid that contains carbohydrates, including juice and milk, for prolonged periods are at risk for developing dental caries (tooth decay). Infants should not be put to bed at night or at naptime with a bottle or allowed unlimited access to a bottle (ie, permitting the infant to carry a bottle around whenever he wants).
8. Honey should not be added to food, water, or formula that is fed to infants, because it can be a source of spores that cause botulism poisoning in infants. Processed foods containing honey should not be given to infants.
9. Starting at age 6 months, infants receiving breast milk only or infant formula prepared with water need fluoride supplementation if the water is severely deficient in fluoride. To assess fluoride levels, ask about all sources of water used by the family, including municipal, well, commercially bottled, and home system–processed water. In addition, find out whether any ready-to-feed infant formula used is manufactured with water that has little or no fluoride. Refer an infant who is not getting enough fluoride to a dentist or primary care health professional for follow-up.

10–11. If inadequate cooking or food-storage facilities adversely affect a family's nutrient intake, refer the family to social services. If a family does not have adequate resources to obtain food, refer them to nutrition assistance programs such as the Special Supplemental Nutrition Program for Women, Infants and Children (WIC) and the Supplemental Nutrition Assistance Program (SNAP) or to a community food shelf or pantry. (See Tool K: Federal Nutrition Assistance Programs.)

12. Respond to parents' questions and concerns.

TOOL A: NUTRITION QUESTIONNAIRE FOR INFANTS

1. How would you describe feeding time with your baby? *(Check all that apply.)*
   - ☐ Always pleasant
   - ☐ Usually pleasant
   - ☐ Sometimes pleasant
   - ☐ Never pleasant
2. How do you know when your baby is hungry or has had enough to eat?

3. What type of milk do you feed your baby, and how often? *(Check all that apply.)*
   - ☐ Breast milk
   - ☐ Iron-fortified infant formula
   - ☐ Evaporated milk
   - ☐ Whole milk
   - ☐ Reduced-fat (2%) milk
   - ☐ Low-fat (1%) milk
   - ☐ Fat-free (skim) milk
   - ☐ Goat's milk
   - ☐ Soy milk
4. What types of things can your baby do? *(Check all that apply.)*
   - ☐ Open mouth for breast or bottle
   - ☐ Drink liquids
   - ☐ Follow objects and sounds with eyes
   - ☐ Put hand in mouth
   - ☐ Sit with support
   - ☐ Bring objects to mouth and bite them
   - ☐ Hold bottle without support
   - ☐ Drink from a cup that is held
5. Does your baby eat solid foods? If yes, which ones?

6. Does your baby drink juice? If yes, how much?

7. Does your baby take a bottle to bed at night or carry a bottle around during the day?

8. Do you add honey to your baby's bottle or dip your baby's pacifier in honey?

9. What is the source of the water your baby drinks? Sources include public, well, commercially bottled, and home system–processed water.

10. Do you have a working stove, oven, and refrigerator where you live?

11. Were there any days last month when your family didn't have enough food to eat or enough money to buy food?

12. What concerns or questions do you have about feeding your baby or how your baby is growing? Do you have any concerns or questions about your baby's weight?

TOOL B

Nutrition Questionnaire for Children Ages 1 to 10

The nutrition questionnaire for children is a tool for parents to complete before meeting with a health professional. The questionnaire provides a useful starting point for identifying areas of nutrition concern and determining whether additional screening is needed.

When reviewing responses to the questionnaire, use the following interpretive notes to identify areas of concern and to determine follow-up questions or actions. The notes are numbered according to their corresponding questions on the questionnaire.

INTERPRETIVE NOTES

1. Children grow more slowly from ages 1 to 5 than in infancy. Their appetites can change from day to day, depending on how fast they are growing and how active they are. As long as they are energetic and growing, they are probably getting enough of the nutrients they need. Young children often eat small portions. They should be offered small servings and should be allowed to ask for more.

   Irregular eating and frequently missing meals can result in an insufficient intake of calories (energy) and nutrients. Busy schedules and inadequate resources for obtaining food may cause children to miss meals.
2. Encourage parents to eat meals together as a family. If children see their parents and other adults enjoying meals together and eating a variety of foods, they will want to do the same. Explain that being a role model is the best way to teach. Allow children to engage in age-appropriate meal preparation activities, such as washing vegetables or helping to prepare a side dish.
3. During mealtimes, a relaxed atmosphere should be maintained, and parents should make an effort not to rush children. Encourage parents to get rid of distractions such as television during meals. Well-balanced meals and snacks should be offered in a pleasant environment. When children are stubborn about eating, it is often their way of learning to be independent. Fighting over food may make them even more stubborn.

4. Children need between 4 and 6 meals and snacks each day; these should be offered at scheduled times and should consist of a variety of healthy foods. Children should be allowed to decide whether and how much to eat at each meal or snack; they should not be pressured to eat certain foods or rewarded for eating certain foods.
5. Children ages 2 to 3 need the same variety of foods and the same number of servings as older children but may need smaller portions—about two-thirds of a serving for each serving that older children eat. By the time children are 4 years old, they need serving sizes similar to those eaten by older family members: 1 slice of bread; 1 cup of raw vegetables; 1 medium-sized piece of fruit; 1 cup of milk or yogurt; and 2 to 3 oz of cooked lean meat, poultry, or fish.

   Grains. Grain products provide vitamins, minerals, complex carbohydrates, and dietary fiber, which are important for good health. Children need 3 to 6 oz (6–11 servings) per day of grains, of which at least half should be whole grains.

   Vegetables. Vegetables are an important source of many nutrients, including potassium; folic acid; vitamins A, E, and C; and fiber. Children need 1 to 2½ cups (3–5 servings) per day.

   Fruits. Fruits provide vitamins, minerals, and dietary fiber. Children need 1 to 1½ cups (2–4 servings) per day. Many juice beverages are not 100% juice. Parents need to check the ingredients to make sure that they purchase juice without added sugar such as corn syrup. If parents purchase canned or packaged fruits, they should choose varieties with little or no added sugar.

   Milk and milk products. Milk, yogurt, cheese, and other milk products supply calcium for building and maintaining strong bones and teeth and protecting bones from osteoporosis. Children need 2 to 3 servings per day. Children ages 1 to 2 need whole milk. After age 2, children should gradually increase the proportion of low-fat foods in their diets. For children older than 2, low-fat (1%) or fat-free (skim) milk is recommended. Reduced-fat milk (2%) is recommended for children ages 1 to 2 years for whom obesity is a concern or who have a family history of obesity, dyslipidemia, or cardiovascular disease.

   Meat and meat alternatives. Meat and meat alternatives include both animal and plant sources of protein, iron, and other important nutrients. Children need 2 to 5 oz (2–3 servings) per day. Between 2 and 3 oz of cooked lean meat, poultry, or fish equal one serving from this group. One egg or ½ cup of cooked dry beans counts as 1 oz of lean meat; 2 tablespoons of peanut butter count as 1 oz of meat.

   Fats and sweets. This group includes butter, margarine, mayonnaise, vegetable oil, gravy, salad dressing, cake/cupcakes, pie, cookies, chips, doughnuts, and candy. There is no recommended serving. Consumption of fats and sweets should be limited. If allowed to consume sweets in unlimited amounts, children are likely to fill up on these rather than eat healthy foods.
6. For children younger than 3, foods that may cause choking need to be avoided (eg, hard or chewy candy, mini-marshmallows, popcorn, pretzels, chips, spoonfuls of peanut butter, nuts, seeds, large chunks of meat, hot dogs, raw carrots, raisins and other dried fruits, whole grapes).

   Young children, especially 3-year-olds, are at risk for choking on food and remain at risk until they can chew and swallow better (at about age 5). Precautions to prevent choking include
   - Staying with children while they are eating.
   - Having children sit while eating, because eating while walking or running can cause choking.
   - Keeping things calm during meal or snack times, because becoming excited while eating can cause choking.
   - Observing children who have received rub-on teething medications, because these medications may affect chewing and swallowing.

- Avoiding eating in the car. If the parent is driving, helping a choking child will be difficult.

For children ages 3 to 5, foods that may cause choking can be modified to make them safer (eg, by cutting hot dogs in quarters lengthwise and then into small pieces, cutting whole grapes in half lengthwise, chopping nuts finely, chopping raw carrots finely or into thin strips, spreading peanut butter thinly on crackers or bread).

7. Juice should be offered in small amounts because too much juice may reduce a child's appetite for food. Serve only 100% fruit juice. Limit juice consumption to 4 to 6 oz per day. Parents should also limit sweetened drinks such as fruit punch, soft drinks, lemonade, and other sweetened beverages.
8. Children permitted to suck on a bottle of any fluid that contains carbohydrates, including juice and milk, for prolonged periods are at risk for developing dental caries (tooth decay). Children should not be put to bed at night or at naptime with a bottle or allowed unlimited access to a bottle (ie, permitting the child to carry a bottle around whenever she wants).
9. Children need fluoride supplementation if the water is severely deficient in fluoride. To assess fluoride levels, ask about all sources of water used by the family, including municipal, well, commercially bottled, and home system–processed water. Refer a child who is not getting enough fluoride to a dentist or primary care health professional for follow-up.

10–11. If inadequate cooking or food-storage facilities adversely affect a family's nutrient intake, refer the family to social services. If a family does not have adequate resources to obtain food, refer them to nutrition assistance programs such as the National School Lunch Program (NSLP), the Special Supplemental Nutrition Program for Women, Infants and Children (WIC) and the Supplemental Nutrition Assistance Program (SNAP), or to a community food shelf or pantry. (See Tool K: Federal Nutrition Assistance Programs.)

12. Children can achieve substantial health benefits by doing moderate- and vigorous-intensity physical activity for a total of 60 minutes or more each day. This should include aerobic activity as well as age-appropriate muscle- and bone-strengthening (weight-bearing) activities. The benefits of physical activity include giving children a feeling of accomplishment, reducing the risk of certain diseases (eg, diabetes mellitus, hypertension) if they continue to be active during adulthood, helping children achieve or maintain a healthy weight, and promoting mental health. Help the inactive child identify enjoyable activities and incorporate them into a daily routine.
13. Children who spend too much time watching television and DVDs or playing computer games are likely to have a sedentary lifestyle, which can lead to overweight. These activities should be limited to 1 to 2 hours per day.
14. Watching television during mealtimes is a distraction that prevents family interaction and interferes with a child's eating. Value the time spent together while eating. Often it is the only time during the day that families can be together.
15. Respond to parents' questions and concerns.

TOOL B: NUTRITION QUESTIONNAIRE FOR CHILDREN AGES 1 TO 10

1. How would you describe your child's appetite?
   - ☐ Good
   - ☐ Fair
   - ☐ Poor

2. How many days per week does your family eat meals together?

3. How would you describe mealtimes with your child?
   - ☐ Always pleasant
   - ☐ Usually pleasant
   - ☐ Sometimes pleasant
   - ☐ Never pleasant

4. How many meals does your child eat per day? How many snacks?

5. Which of these foods did your child eat or drink last week? *(Check all that apply.)*

Grains
- ☐ Bagels
- ☐ Bread
- ☐ Cereal/grits
- ☐ Crackers
- ☐ Muffins
- ☐ Noodles/pasta/rice
- ☐ Rolls
- ☐ Tortillas
- ☐ Other grains: _____

Vegetables
- ☐ Broccoli
- ☐ Carrots
- ☐ Corn
- ☐ Green beans
- ☐ Green salad
- ☐ Greens (collard, spinach)
- ☐ Peas
- ☐ Potatoes
- ☐ Tomatoes
- ☐ Other vegetables: _____

Fruits
- ☐ Apples/juice
- ☐ Bananas
- ☐ Grapefruit/juice
- ☐ Grapes/juice
- ☐ Melon
- ☐ Oranges/juice
- ☐ Peaches
- ☐ Pears
- ☐ Other fruits/juice: _____

Milk and Milk Products
- ☐ Fat-free (skim) milk
- ☐ Low-fat (1%) milk
- ☐ Reduced-fat (2%) milk
- ☐ Whole milk
- ☐ Flavored milk
- ☐ Cheese
- ☐ Ice cream
- ☐ Yogurt
- ☐ Other milk and milk products: _____

Meat and Meat Alternatives
- ☐ Beef/hamburger
- ☐ Chicken
- ☐ Cold cuts/deli meats
- ☐ Dried beans (for example, black beans, kidney beans, pinto beans)
- ☐ Eggs
- ☐ Fish
- ☐ Peanut butter/nuts
- ☐ Pork
- ☐ Sausage/bacon
- ☐ Tofu
- ☐ Turkey
- ☐ Other meat and meat alternatives: _____

Fats and Sweets
- ☐ Cake/cupcakes
- ☐ Candy
- ☐ Chips
- ☐ French fries
- ☐ Cookies
- ☐ Doughnuts
- ☐ Fruit-flavored drinks
- ☐ Pie
- ☐ Soft drinks
- ☐ Other fats and sweets: _____

6. If your child is 5 years or younger, does he or she eat any of these foods? *(Check all that apply.)*
   - ☐ Hot dogs
   - ☐ Marshmallows
   - ☐ Nuts and seeds
   - ☐ Peanut butter
   - ☐ Popcorn
   - ☐ Pretzels and chips
   - ☐ Raisins
   - ☐ Raw celery or carrots
   - ☐ Hard or chewy candy
   - ☐ Whole grapes
7. How much juice does your child drink per day? How much sweetened beverage (for example, fruit punch or soft drinks) does your child drink per day?
8. Does your child take a bottle to bed at night or carry a bottle around during the day?
   ☐ Yes ☐ No
9. What is the source of the water your child drinks? Sources include public, well, commercially bottled, and home system–processed water.
10. Do you have a working stove, oven, and refrigerator where you live?
    ☐ Yes ☐ No
11. Were there any days last month when your family didn't have enough food to eat or enough money to buy food?
12. Did you participate in physical activity (for example, walking or riding a bike) in the past week?
    ☐ Yes ☐ No
    If yes, on how many days and for how many minutes or hours per day? _____
13. Does your child spend more than 2 hours per day watching television and DVDs or playing computer games?
    ☐ Yes ☐ No
    If yes, how many hours per day? _____
14. Does the family watch television during meals?
    ☐ Yes ☐ No
15. What concerns or questions do you have about feeding your child or how your child is growing? Do you have any concerns or questions about your child's weight?

TOOL C

Nutrition Questionnaire for Adolescents Ages 11 to 21

The nutrition questionnaire for adolescents is a tool for adolescents or parents to complete before meeting with a health professional. The questionnaire provides a useful starting point for identifying areas of nutrition concern and determining whether additional screening is needed.

When reviewing responses to the questionnaire, use the following interpretive notes to identify areas of concern and determine follow-up questions or actions. The notes are numbered according to their corresponding questions on the questionnaire.

INTERPRETIVE NOTES

EATING BEHAVIORS

1–2. Irregular eating and frequently missing meals can result in a low intake of calories (energy) and nutrients. Busy schedules and inadequate resources for obtaining food may cause an adolescent to miss meals. Reinforce the importance of eating 3 meals instead of frequent snacks per day.

3. Adolescents who are on their own for most meals—perhaps because of a busy schedule—may not have healthy eating behaviors. Remind adolescents and parents that family meals ensure optimal nutrition and encourage communication. Explain to parents that family meals give them the opportunity to model healthy eating behaviors.

4. Shopping for and preparing food give adolescents the opportunity to learn about healthy food choices. Make sure the adolescent is familiar with the basic rules of food safety. (See Tool H: Basics for Handling Food Safely.)

5. Consumption of convenience and fast foods is common among Americans. Frequent consumption increases fat, caloric, and sodium intake and reduces the intake of certain vitamins and minerals. Suggest that adolescents limit the consumption of these foods, and offer suggestions for making healthier food choices when eating away from home.
6. If the adolescent is on a special diet, ask, "What kind of diet are you on?" This will provide an opportunity to evaluate the adolescent's dietary management of conditions such as diabetes mellitus or food allergies. Refer to a registered dietitian, if appropriate.
7. Individuals' interpretations of the meaning of the term *vegetarian* can vary greatly. Ask adolescents who are vegetarian to name the foods they eliminate from their diet as a vegetarian. Further dietary assessment is recommended.
8. Changes (either increases or decreases) in weight or appetite may indicate depression or other emotional stress, and they warrant further assessment. Changes in weight or appetite may also indicate that an adolescent is engaging in restrictive dieting or disordered eating, which may predispose them to an eating disorder. Detailed dietary and psychological assessments are recommended.
9. Soft drinks, fruit-flavored drinks, sports drinks, energy drinks, and recovery drinks may displace healthier beverages (eg, milk, which provides calcium, protein, and vitamins; orange juice, which is an important source of vitamin C and folate).

Food Choices

10. *Grains.* Grains supply complex carbohydrates (which are important sources of energy), protein, and minerals; they also tend to be low in fat. Whole grains are a good source of dietary fiber. Six to 11 servings (5–7 oz) of grains per day are recommended; at least half of these servings should be whole grains.

    Vegetables. Vegetables are an important source of many nutrients, including potassium; folic acid; vitamins A, E, and C; and fiber. Two to 3 cups of vegetables per day are recommended, depending on age and gender.

    Fruits. Fruits are important sources of vitamins and fiber and are low in fat. Citrus fruits and juices, strawberries, and cantaloupe are good sources of vitamin C and folate. One and one-half to 2 cups of fruits per day are recommended, based on age and gender.

    Milk and milk products. Milk, yogurt, and cheese are good sources of calcium and provide protein, vitamins, and minerals. Three or more servings per day of milk and milk products are recommended. Encourage the adolescent to consume reduced-fat (2%), low-fat (1%), or fat-free (skim) milk and other lower-fat milk products. Adequate calcium intake during adolescence is essential for peak bone mass development. If the recommended calcium intake cannot be met by diet, a supplement may be warranted. Of the various forms of calcium, calcium carbonate contains the highest proportion (40%) of elemental calcium by weight.

    Meat and meat alternatives. Red meat, poultry, fish, eggs, and dried beans provide protein, iron, zinc, and many other minerals and vitamins. Adequate protein intake is essential for growth and development. Two to 3 servings (or 5–6 oz) of meat or meat alternatives per day are recommended. Cold cuts, bacon, sausage, and fried meats are high in fat and calories; therefore, their consumption should be limited.

    Fats and sweets. This group includes butter, margarine, mayonnaise, vegetable oil, gravy, salad dressing, cake, cupcakes, pie, cookies, chips, doughnuts, and candy. There is no recommended serving because consumption of fats and sweets should be limited.

Food Resources

11–12. If inadequate cooking or food-storage facilities adversely affect a family's nutrient intake, refer the family to social services. If a family does not have adequate resources to obtain food, refer the family to nutrition assistance programs such

as the National School Lunch Program (NSLP) and the Supplemental Nutrition Assistance Program (SNAP), or to a community food shelf or pantry. (See Tool K: Federal Nutrition Assistance Programs.)

Weight and Body Image

13. Some adolescents may be dissatisfied with their weight and use unhealthy means to alter it. If the adolescent expresses a concern about weight, follow up with questions such as "How would you classify your weight?" or "Are you doing anything to try to change your weight?"
14. If the adolescent is dieting, determine the frequency, duration, and methods of weight loss. Chronic food restriction and inadequate energy intake may cause poor growth, delayed sexual development, menstrual irregularities, poor concentration, irritability, sleep difficulties, and constipation. Frequent dieting may be associated with binge eating. Purging (eg, self-induced vomiting, laxative use) may be associated with other risk behaviors (eg, substance use, suicide attempts).
15. Self-induced vomiting; the use of laxatives, diuretics, or diet pills; or both are warning signs of eating disorders. Adolescents who engage in these behaviors need further assessment.

Physical Activity

16. Adolescents can achieve substantial health benefits by doing moderate- and vigorous-intensity physical activity for a total of 60 minutes or more each day. This should include aerobic activity as well as age-appropriate muscle- and bone-strengthening (weight-bearing) activities. The benefits of physical activity include giving adolescents a feeling of accomplishment, reducing the risk of certain diseases (eg, diabetes mellitus, hypertension) if they continue to be active during adulthood, and promoting mental health. Help the inactive adolescent identify enjoyable activities and incorporate them into a daily routine.

    Some adolescents engage in physical activity to compensate for caloric intake as a form of purging. Excessive physical activity (>2 hours per day) may lead to fatigue, loss of appetite, or menstrual irregularities and may be a sign of an eating disorder.

Lifestyle

17. Adolescents who spend too much time watching television and DVDs or playing computer games are likely to have a sedentary lifestyle, which can lead to overweight. These sedentary activities should be limited to 1 to 2 hours per day.
18. Watching television during mealtimes is a distraction that prevents family interaction and interferes with a child's eating. Value the time spent together while eating. Often it is the only time during the day that families can be together.
19. If the adolescent uses vitamin, mineral, herbal, or other dietary supplements, ask about the kind, dosage, length of use, and reason for use. Encourage the adolescent to eat healthy foods instead of using supplements to obtain nutrients. If the adolescent is interested in vitamin supplements, emphasize the importance of using low-dose supplements and the need to avoid high doses (particularly of vitamin A), which can be toxic.

    Adolescents who engage in physical activities in which strength is a critical factor (eg, football, weightlifting) may consume a high-protein diet or take protein supplements in an attempt to increase strength and muscle mass. However, increased protein intake does not affect muscle size.

    Adolescents who use protein supplements should be asked about anabolic steroid use. Some adolescents take anabolic steroids to enhance their strength, muscle size, and endurance. Steroid use can cause side effects, including acne, deepening of the voice, and hair recession.
20. Unhealthy behaviors occur in clusters in adolescents. For example, adolescents who smoke are more likely to have unhealthy eating behaviors and low levels of physical activity. Adolescents who smoke to lose weight need counseling on both smoking and healthy weight management. Cigarette smoking also increases the need for vitamin C.

21. If the adolescent admits to using alcohol or street drugs, screen for substance abuse, and refer for counseling and treatment. (Refer to CRAFFT, a behavioral health screening tool for use with children and adolescents younger than 21).

    Some adolescents take anabolic steroids to enhance their strength, muscle size, and endurance. Steroid use can cause side effects, including acne, deepening of the voice, and hair recession. Emphasize the dangers of steroid use to adolescents who engage in strenuous physical activity to build muscle or who participate in sports in which strength is a critical factor (eg, football, weightlifting).

TOOL C: NUTRITION QUESTIONNAIRE FOR ADOLESCENTS AGES 11 TO 21

1. Which of these meals or snacks did you eat yesterday? *(Check all that apply.)*
   - ☐ Breakfast
   - ☐ Lunch
   - ☐ Dinner or supper
   - ☐ Morning snack
   - ☐ Afternoon snack
   - ☐ Evening/late-night snack

2. Do you skip breakfast 3 or more times a week?
   ☐ Yes ☐ No

   Do you skip lunch 3 or more times a week?
   ☐ Yes ☐ No

   Do you skip dinner or supper 3 or more times a week?
   ☐ Yes ☐ No

3. Do you eat dinner or supper with your family 4 or more times a week?
   ☐ Yes ☐ No

4. Do you fix or buy the food for any of your family's meals?
   ☐ Yes ☐ No

5. Do you eat or take out a meal from a fast-food restaurant 2 or more times a week?
   ☐ Yes ☐ No

6. Are you on a special diet for medical reasons?
   ☐ Yes ☐ No

7. Are you a vegetarian?
   ☐ Yes ☐ No

8. Do you have any problems with your appetite, like not feeling hungry, or feeling hungry all the time?
   ☐ Yes ☐ No

9. Which of the following did you drink last week? *(Check all that apply.)*
   - ☐ Tap or bottled water
   - ☐ Fitness water
   - ☐ Juice
   - ☐ Regular soft drinks
   - ☐ Diet soft drinks
   - ☐ Fruit-flavored drinks
   - ☐ Sports drinks
   - ☐ Energy drinks
   - ☐ Recovery drinks
   - ☐ Fat-free (skim) milk
   - ☐ Low-fat (1%) milk
   - ☐ Reduced-fat (2%) milk
   - ☐ Whole milk
   - ☐ Flavored milk (for example, chocolate, strawberry)
   - ☐ Coffee or tea
   - ☐ Beer, wine, or hard liquor

10. Which of these foods did you eat last week? *(Check all that apply.)*

Grains
- ☐ Bagels
- ☐ Bread
- ☐ Cereal or grits
- ☐ Crackers
- ☐ Muffins
- ☐ Noodles, pasta, or rice
- ☐ Rolls
- ☐ Tortillas
- ☐ Other grains: _____

Vegetables
- ☐ Broccoli
- ☐ Carrots
- ☐ Corn
- ☐ Green beans
- ☐ Green salad
- ☐ Greens (collard, spinach)
- ☐ Peas
- ☐ Potatoes
- ☐ Tomatoes
- ☐ Other vegetables: _____

Fruits
- ☐ Apples or apple juice
- ☐ Bananas
- ☐ Grapefruits or grapefruit juice
- ☐ Grapes or grape juice
- ☐ Melon
- ☐ Oranges or orange juice
- ☐ Peaches
- ☐ Pears
- ☐ Other fruits or other fruit juice: _____

Milk and Milk Products
- ☐ Fat-free (skim) milk
- ☐ Low-fat (1%) milk
- ☐ Reduced-fat (2%) milk
- ☐ Whole milk
- ☐ Flavored milk
- ☐ Cheese

- ☐ Ice cream
- ☐ Yogurt
- ☐ Other milk and milk products: _____

Meat and Meat Alternatives

- ☐ Beef or hamburger
- ☐ Chicken
- ☐ Cold cuts/deli meats
- ☐ Dried beans (for example, black beans, kidney beans, pinto beans)
- ☐ Eggs
- ☐ Fish
- ☐ Peanut butter or nuts
- ☐ Pork
- ☐ Sausage or bacon
- ☐ Tofu
- ☐ Turkey
- ☐ Other meat and meat alternatives: _____

Fats and Sweets

- ☐ Cake or cupcakes
- ☐ Candy
- ☐ Chips
- ☐ French fries
- ☐ Cookies
- ☐ Doughnuts
- ☐ Fruit-flavored drinks
- ☐ Pie
- ☐ Soft drinks
- ☐ Other fats and sweets: _____

11. Do you have a working stove, oven, and refrigerator where you live?
    ☐ Yes ☐ No
12. Were there any days last month when your family didn't have enough food to eat or enough money to buy food?
    ☐ Yes ☐ No
13. Are you concerned about your weight?
    ☐ Yes ☐ No
14. Are you on a diet now to lose weight or to maintain your weight?
    ☐ Yes ☐ No
15. In the past year, have you tried to lose weight or control your weight by vomiting, taking diet pills or laxatives, or not eating?
    ☐ Yes ☐ No
16. Did you participate in physical activity (for example, walking or riding a bike) in the past week?
    ☐ Yes ☐ No

    If yes, on how many days and for how many minutes or hours per day? _____
17. Do you spend more than 2 hours per day watching television and DVDs or playing computer games?
    ☐ Yes ☐ No

    If yes, how many hours per day? _____
18. Does the family watch television during meals?
    ☐ Yes ☐ No
19. Do you take vitamin, mineral, herbal, or other dietary supplements (for example, protein powders)?
    ☐ Yes ☐ No
20. Do you smoke cigarettes or chew tobacco?
    ☐ Yes ☐ No
21. Do you ever use any of the following? *(Check all that apply.)*
    - ☐ Alcohol, beer, or wine
    - ☐ Steroids (without a doctor's permission)
    - ☐ Street drugs (marijuana, speed, crack, or heroin)

TOOL D

Key Indicators of Nutrition Risk for Children and Adolescents

INDICATORS OF NUTRITION RISK	RELEVANCE	CRITERIA FOR FURTHER SCREENING AND ASSESSMENT
Food Choices		
Consumes <2 servings of fruits per day. Consumes <3 servings of vegetables per day.	Fruits and vegetables provide vitamins (such as A and C), minerals, and fiber. Low intake of fruits and vegetables is associated with an increased risk of many types of cancer.	Assess the child or adolescent who is consuming <1 serving of fruit per day. Assess the child or adolescent who is consuming <2 servings of vegetables per day.
Consumes <6 servings of cereal, bread, crackers, pasta, rice, or other pasta per day. Consumes <3 servings of whole grains per day.	Grain products provide complex carbohydrates, vitamins, minerals, and fiber. Low intake of fiber is associated with constipation and increased risk of colon cancer.	Assess the child or adolescent who is consuming <6 servings of cereal, bread, crackers, rice, pasta, or other grains per day. Assess the child or adolescent who is consuming <3 servings of whole-grain cereal, bread, crackers, rice, pasta, or other grains per day Assess the child or adolescent who has recent history of constipation.

TOOL D: KEY INDICATORS OF NUTRITION RISK FOR CHILDREN AND ADOLESCENTS, CONTINUED

INDICATORS OF NUTRITION RISK	RELEVANCE	CRITERIA FOR FURTHER SCREENING AND ASSESSMENT
Food Choices, continued		
For children <9: Consumes <2 servings of milk and milk products per day. For children ages ≥9 and adolescents: Consumes <3 servings of milk and milk products per day.	Milk and milk products are a good source of protein, vitamins, and calcium and other minerals. Low intake of milk and milk products may reduce peak bone mass and increase the risk of osteoporosis.	Assess the child (<9) who is consuming <1 serving of milk and milk products per day. Assess the child (≥9) or adolescent who is consuming <2 servings of milk and milk products per day. Assess the child or adolescent who has a milk allergy or is lactose intolerant. Assess the child or adolescent who is consuming >2 soft drinks per day.
Consumes <2 servings of meat or meat alternatives (eg, beans, eggs, nuts, seeds) per day.	Protein-rich foods (eg, meats, meat alternatives) are good sources of B vitamins, iron, and zinc. Low intake of protein-rich foods may impair growth and increase the risk of iron-deficiency anemia and of delayed growth and sexual maturation. Low intake of meat or meat alternatives may indicate inadequate availability of these foods at home. Special attention should be paid to children and adolescents who follow a vegetarian diet.	Assess the child or adolescent who is consuming <1 serving of meat or meat alternatives per day.
For children ≥5: Consumes excessive amount of fat.	Excessive intake of dietary fat contributes to the risk of cardiovascular disease and obesity and is associated with some cancers.	Assess the child or adolescent who has a family history of premature cardiovascular disease. Assess the child or adolescent if body mass index (BMI) is ≥85th percentile.
Eating Behaviors		
Exhibits poor appetite.	A poor appetite may be developmentally appropriate for young children, but in older children and adolescents it may indicate depression or other emotional stress, or a chronic disease.	Assess the child or adolescent if BMI is <15th percentile or if weight loss has occurred. Assess the child or adolescent if irregular menses or amenorrhea has occurred for ≥3 months. Assess the child or adolescent for organic and psychiatric disease.

TOOL D: KEY INDICATORS OF NUTRITION RISK FOR CHILDREN AND ADOLESCENTS, CONTINUED

INDICATORS OF NUTRITION RISK	RELEVANCE	CRITERIA FOR FURTHER SCREENING AND ASSESSMENT
Eating Behaviors, continued		
Consumes food from fast-food restaurants ≥3 times per week.	Excessive consumption of convenience foods and foods from fast-food restaurants is associated with high fat, calorie, and sodium intake, as well as low intake of certain vitamins and minerals.	Assess the child or adolescent who is overweight or obese or who has diabetes mellitus, hyperlipidemia, or other conditions requiring reduction in dietary fat.
Skips breakfast, lunch, or dinner or supper ≥3 times per week.	Meal-skipping is associated with a low intake of energy and essential nutrients and, if it is a regular practice, could compromise growth and development. Repeatedly skipping meals decreases the nutritional adequacy of the diet.	Assess the child or adolescent to ensure that meal-skipping is not due to inadequate food resources or unhealthy weight-loss practices.
Has food jags—eats one particular food only.	Food jags, which limit the variety of food consumed, decrease the nutritional adequacy of the diet.	Assess the child's or adolescent's dietary intake over several days.
Food Resources		
Has inadequate financial resources to buy food, insufficient access to food, or lack of access to cooking facilities.	Poverty can result in hunger and compromised food quality and nutrition status. Inadequate dietary intake interferes with learning.	Assess the child or adolescent who is from a family with low income, is homeless, or is a runaway.
Weight and Body Image		
Practices unhealthy behaviors (eg, chronic dieting; vomiting; and using laxatives, diuretics, or diet pills to lose weight).	Chronic dieting is associated with many health concerns (eg, fatigue, impaired growth and sexual maturation, irritability, poor concentration, impulse to binge) and can lead to eating disorders. Frequent dieting in combination with purging is associated with health-compromising behaviors (eg, substance use, suicidal behaviors). Purging is associated with serious medical complications.	Assess the child or adolescent for eating disorders. Assess the child or adolescent for organic and psychiatric disease.
Is excessively concerned about body size or shape.	Eating disorders are associated with significant health and psychosocial morbidity. Eighty-five percent of all cases of eating disorders begin during adolescence. The earlier adolescents are treated, the better their long-term prognosis.	Assess the child or adolescent for distorted body image and dysfunctional eating behaviors, especially if the child or adolescent wants to lose weight but BMI is <85th percentile.
Exhibits significant weight change in past 6 months.	Significant weight change during the past 6 months may indicate stress, depression, organic disease, or an eating disorder.	Assess the child or adolescent to determine the cause of weight loss or weight gain (eg, limited or too much access to food, poor appetite, meal-skipping, eating disorder).

TOOL D: KEY INDICATORS OF NUTRITION RISK FOR CHILDREN AND ADOLESCENTS, CONTINUED

INDICATORS OF NUTRITION RISK	RELEVANCE	CRITERIA FOR FURTHER SCREENING AND ASSESSMENT
Growth		
Has BMI <5th percentile.	Thinness may indicate an eating disorder or poor nutrition.	Assess the child or adolescent for eating disorders. Assess the child or adolescent for organic or psychiatric disease. Assess the child or adolescent for inadequate food resources.
Has BMI >85th percentile.	Overweight children and adolescents are more likely to be overweight adults and are at increased risk for health problems as adults. Obesity is associated with elevated cholesterol levels and elevated blood pressure. Obesity is an independent risk factor for cardiovascular disease and type 2 diabetes mellitus.	Assess the child or adolescent who is at risk for overweight.
Physical Activity		
Is physically inactive: participates in physical activity <5 days per week.	Lack of physical activity is associated with overweight and obesity, fatigue, and poor muscle tone in the short term, and a greater risk of cardiovascular disease in the long term. Regular physical activity reduces the risk of cardiovascular disease, hypertension, colon cancer, and type 2 diabetes mellitus. Weight-bearing physical activity is essential for normal skeletal development during childhood. Regular physical activity is necessary for maintaining normal muscle strength, joint structure, and joint function; contributes to psychological health and well-being; and facilitates weight reduction and weight maintenance throughout life.	Assess how much time the child or adolescent spends watching television or DVDs and playing computer games. Assess the child's or adolescent's definition of physical activity.

TOOL D: KEY INDICATORS OF NUTRITION RISK FOR CHILDREN AND ADOLESCENTS, CONTINUED

INDICATORS OF NUTRITION RISK	RELEVANCE	CRITERIA FOR FURTHER SCREENING AND ASSESSMENT
Participates in excessive physical activity.	Intense physical activity nearly every day, sometimes more than once a day, can be unhealthy and may be associated with menstrual irregularity, excessive weight loss, and malnutrition.	Assess the child or adolescent for eating disorders.
Lifestyle		
Engages in heavy alcohol, tobacco, and other drug use.	Alcohol, tobacco, and other drug use can adversely affect nutrient intake and nutrition status.	Assess the child or adolescent further for alcohol, tobacco, and other drug use.
Uses dietary supplements.	Dietary supplements (eg, vitamin and mineral preparations) can be healthy additions to a diet for children or adolescents with a history of iron-deficiency anemia; however, high doses can have serious side effects. Adolescents who use supplements to "bulk up" may be tempted to experiment with anabolic steroids.	Assess the child or adolescent for the type of supplements used and dosage. Assess adolescent's use of anabolic steroids and mega doses of other supplements.

TOOL E

Screening for Elevated Blood Lead Levels

Lead is a common environmental contaminant, and exposure to lead is a preventable risk that exists in all areas of the United States. Children ages 1 through 5 have the highest prevalence of elevated blood lead levels (defined as ≥10 µg/dL[1]). According to National Health and Nutrition Examination Survey 1999–2002 data, 1.6% of children ages 1 through 5 had elevated blood lead levels during the study period; the highest prevalence of all age groups.[2] Blood lead levels as low as 10 µg/dL have been associated with adverse effects on cognitive development, growth, and behavior among children ages 1 through 5.[3] High blood levels (ie, ≥70 µg/dL) can cause serious health problems, including seizures, comas, and even death.[3]

The Centers for Disease Control and Prevention (CDC) published guidance to help health professionals working in state and local public health agencies determine which children are at risk for elevated blood lead levels and are most likely to benefit from lead screening.[1] The American Academy of Pediatrics (AAP) supports these guidelines. The following information has been compiled from CDC and AAP guidelines.[1,4,5] The Centers for Medicare & Medicaid requires that all children enrolled in Medicaid be screened, because they are at greater risk for elevated blood lead levels than non-enrolled children.

RISK FACTORS

Children are at the greatest risk for elevated blood lead levels due to their hand-to-mouth activity, the increased potential for gastrointestinal absorption, and the vulnerability of the central nervous system during the developmental period.[6] Risk factors for elevated blood lead levels among children include[4,6,7]

- Minority race or ethnicity
- Recent immigration or adoption
- From family with low income
- Live in an urban area
- Live in home built prior to 1950
- Live in home recently renovated or remodeled
- Exposure to lead-contaminated dust or soil
- Exposure to lead-glazed pottery

- Exposure to lead-based toys, crayons, or cosmetics
- Folk remedy use
- Parents exposed to lead
- Pica
- Iron deficiency
- Developmental delay with oral behaviors
- Abused or neglected

SCREENING

Because children with elevated blood lead levels in the 10 to 25 µg/dL range do not develop clinical symptoms, screening is necessary to identify those who need environmental or medical intervention to reduce their blood lead levels.[4]

To prevent lead poisoning, health professionals should screen children for elevated blood lead levels at age 12 months and consider them again at age 24 months when blood lead levels peak (Box 1), except in communities with sufficient data to conclude that children are not at risk for lead exposure. In addition, health professionals should assess children's risk for elevated blood lead levels at ages 6, 9, and 18 months and at ages 3, 4, 5, and 6 years. If a child tests positive, appropriate action should follow.[5]

BOX 1. SCREENING FOR LEAD EXPOSURE IN CHILDREN[a,b]

1. Does your child live in or regularly visit a home or child-care facility that was built before 1950?
2. Does your child live in or regularly visit a home or child-care facility built before 1978 that is being or has recently been renovated or remodeled (within the last 6 months)?
3. Does your child have a sibling or playmate who has or did have lead poisoning?

[a]Source: American Academy of Pediatrics Committee on Environmental Health.[4]
[b]Additional or different questions may be needed based on specific local exposures.

SCREENING FOR CHILDREN ENROLLED IN MEDICAID

Blood lead level screening is required at age 1 and 2 years for all children who are enrolled in Medicaid as part of prevention services provided through the Early and Periodic Screening, Diagnosis, and Treatment program. All children ages 36 to 72 months who have not been previously screened must also receive a blood lead test. Children with elevated blood lead levels require further evaluation and appropriate follow-up care.[8]

ANTICIPATORY GUIDANCE

Health professionals should provide anticipatory guidance on lead exposure to parents of all infants and young children, including information on risk factors and specific prevention strategies (Table 1).[4]

- Discuss with parents sources of lead, and help them identify sources of lead in their child's environment.
- Obtain an environmental and family occupational history, and educate parents about the most common sources of childhood lead exposure for their child and in their community.
- Encourage parents to identify lead hazards and sources in their homes and to reduce their child's potential for exposure to lead.
- Warn parents about the dangers posed by unsafe renovation methods, and explain that they need to be cognizant of the possibility of new and reemerging sources of lead in children's environments.
- Direct parents to local, state, and federal agencies and organizations for information, particularly concerning methods to identify and safely repair lead hazards.[9]
- Discuss with parents the potential impact of lead on child development, and promote strategies that foster optimal development, including providing nurturing and enriching experiences.
- For all children from families with low incomes living in areas where exposure to lead is likely, promote participation in early enrichment programs, regardless of the child's blood lead levels.[9]

TABLE 1. RISK FACTORS AND PREVENTION STRATEGIES FOR LEAD EXPOSURE IN CHILDREN[a]

Risk Factor	Prevention Strategy
Environmental	
Lead-based paint	Identify and abate.
Home renovation	Ensure the proper containment of building hazards and proper ventilation.
Buying or renting a new home	Inquire about lead hazards.
Dust	Use a wet mop to clean; wash hands frequently.
Hobbies	Ensure the proper use, storage, and ventilation of materials.
Soil	Restrict play in area; plant ground cover; wash hands frequently.
Drinking water	Flush water for 2 minutes before using in morning; use cold water for cooking, drinking.
Old ceramic or pewter cookware, old urns/kettles	Avoid use.
Some imported toys, crayons, or cosmetics	Avoid use.
Folk remedies	Avoid use.
Parental occupations	Remove work clothing at work.
Host	
Hand-to-mouth activity (or pica)	Wash hands frequently.
Inadequate nutrition	Ensure that diet is high in iron and calcium and low in fat; eat frequent small meals.
Developmental disabilities	Screen frequently for lead exposure.

[a]Source: American Academy of Pediatrics Committee on Nutrition.[4]

REFERENCES

1. Centers for Disease Control and Prevention. *Screening Young Children for Lead Poisoning: Guidance for State and Local Public Health Officials.* Atlanta, GA: Centers for Disease Control and Prevention; 1997
2. Centers for Disease Control and Prevention. Blood lead levels—United States, 1999–2002. *MMWR Morb Mortal Wkly Rep.* 2005;54(20):513–516
3. National Research Council. *Measuring Lead Exposure in Infants, Children, and Other Sensitive Populations.* Washington, DC: National Academy Press; 1993
4. American Academy of Pediatrics Committee on Environmental Health. Lead exposure in children: prevention, detection, and management. *Pediatrics.* 2005;116(4):1036–1046
5. Hagan JF Jr, Shaw JS, Duncan PM, eds. *Bright Futures: Guidelines for Health Supervision of Infants, Children, and Adolescents,* 3rd ed. Elk Grove Village, IL: American Academy of Pediatrics; 2007
6. US Preventive Services Task Force. Screening for elevated blood lead levels in children and pregnant women: recommendation statement. Rockville, MD: Agency for Healthcare Research and Quality; 2006
7. Centers for Disease Control and Prevention. Elevated blood lead levels among internationally adopted children—United States, 1998. *MMWR Morb Mortal Wkly Rep.* 2000;49(5):97–100
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9. Centers for Disease Control and Prevention Advisory Committee on Childhood Lead Poisoning Prevention. Interpreting and managing blood lead levels <10 microg/dL in children and reducing childhood exposures to lead: recommendations of CDC's Advisory Committee on Childhood Lead Poisoning Prevention. *MMWR Recomm Rep.* 2007;56(RR–8):1–16

TOOL F

Stages of Change—A Model for Nutrition Counseling

STAGE	DESCRIPTION	GOALS	STRATEGIES
Precontemplation	Is unaware of problem and hasn't thought about change. Has no intention of taking action within the next 6 months.	Increase awareness of need for change. Personalize information on risks and benefits.	Create supportive climate for change—allow person to discuss feelings. Discuss personal aspects and health consequences of poor eating or sedentary behavior. Assess knowledge, attitudes, and beliefs. Build on existing knowledge.
Contemplation	Intends to take action within the next 6 months.	Increase motivation and confidence to perform the new behavior.	Identify problematic behaviors. Prioritize behaviors to change. Discuss benefits of behavior change. Identify personal motivational factors. Emphasize positive skills participant demonstrates that support change. Identify barriers to change and possible solutions.
Preparation	Intends to take action within the next 30 days and has taken some behavioral steps in this direction.	Initiate change.	Assist in developing a concrete action plan. Discuss earlier attempts to change and ways to succeed. Suggest initial small, achievable steps to make a change. Provide praise for the positive steps already taken. Elicit support from family and friends.

TOOL F: STAGES OF CHANGE—A MODEL FOR NUTRITION COUNSELING, CONTINUED

STAGE	DESCRIPTION	GOALS	STRATEGIES
Action	Has changed behavior for <6 months.	Commit to change.	Reinforce decision. Reinforce self-confidence. Provide education, resources, and referrals. Assist with self-monitoring, feedback, problem-solving, social support, and reinforcement. Discuss relapse and coping strategies.
Maintenance	Has changed behavior for >6 months.	Reinforce commitment and continue changes and new behaviors.	Plan follow-up to support changes. Help prevent relapse. Assist in coping, reminding, finding alternatives, and avoiding slips and relapses. Encourage addition of more challenging behavior changes if successful with initial changes.

[a]Adapted from: Rimer and Glanz[1] and Sandoval et al.[2]

REFERENCES

1. Rimer B, Glanz K. *Theory at a Glance: A Guide for Health Promotion Practice.* 2nd ed. Bethesda, MD: National Institutes of Health, National Cancer Institute; 2005
2. Sandoval WM, Heller KE, Wiese WH, Childs DA. Stages of change: a model for nutrition counseling. *Top Clin Nutr.* 1994;9:64–69

TOOL G

Strategies for Health Professionals to Promote Healthy Eating Behaviors

STRATEGIES	APPLICATIONS/QUESTIONS
Communication Factors	
Promote positive, nonjudgmental strategies to help the child or adolescent adopt healthy eating behaviors.	Reinforce positive aspects of the child's or adolescent's eating behaviors.
Encourage the child's or adolescent's active participation in changing eating behaviors.	Help the child or adolescent identify barriers that make it difficult to change eating behaviors, and develop a plan of action for adopting new behaviors.
Provide concrete learning situations.	Use charts, food models, and videotapes to reinforce verbal information and instructions.
Focus on the short-term benefits of healthy eating behaviors.	Emphasize that healthy eating behaviors will make the child or adolescent feel good and have more energy.
Understand and respect the child's or adolescent's cultural eating behaviors.	Help the child or adolescent integrate cultural eating behaviors with dietary recommendations.
Use simple terminology.	Avoid using the term *diet* with the child or adolescent because it tends to be associated with weight loss and may be confusing.
Environmental Factors	
Create an office or clinic environment oriented to children or adolescents.	Use posters and materials written for children or adolescents.
Communicate developmentally appropriate health messages.	Use posters and materials that highlight the importance of healthy eating behaviors.
Encourage health professionals and staff to become role models for healthy eating behaviors.	Have health professionals and staff model healthy eating behaviors.

TOOL G: STRATEGIES FOR HEALTH PROFESSIONALS TO PROMOTE HEALTHY EATING BEHAVIORS, CONTINUED

STRATEGIES	APPLICATIONS/QUESTIONS
Readiness to Change	
Identify the child's or adolescent's stage of behavior change and readiness to change based on the Stages of Change model (Tool F).	"Do you want to change the way you eat?" "Are you thinking about changing the way you eat?" "Are you ready to change the way you eat?" "Are you changing the way you eat?" "Are you trying to keep eating the way you have been?"
Facilitate behavior change with counseling strategies tailored to the child or adolescent based on the Stages of Change model (Tool F).	Provide a supportive environment, basic information, and assessment. Prioritize behaviors to be changed, set goals, and identify barriers to change. Develop a plan that incorporates incremental steps for making changes, support, and reinforcement.
Action Plans	
Provide counseling for the child or adolescent who is in the early stages of behavior change or who is unwilling to change.	Increase the child's or adolescent's awareness and knowledge of eating behaviors. Encourage the child or adolescent to make behavior changes.
Provide task-oriented counseling for the child or adolescent who is ready to change eating behaviors.	Encourage a few small, concrete changes first, and build on those. Support and follow up with the child or adolescent who has changed behavior.
Identify and prioritize behavior changes to be made.	Suggest changes that will have a measurable impact on the child's or adolescent's most serious nutrition issues.
Set realistic, achievable goals that are supported by the child's or adolescent's family.	"What will you change?" "What goal is realistic right now?" "How and when will you change, and who will help you?"
Identify and address barriers to behavior change; help reduce barriers when possible.	"What could make it hard for you to make this change—money, friends, or family?" "How can you get around this?"
Make sure that the behavior changes are compatible with the child's or adolescent's lifestyle.	Don't expect the child or adolescent to conform to rigid eating behaviors. Keep in mind current behaviors and realistic goals.
Establish incremental steps to help the child or adolescent change eating behaviors.	For example, have the child or adolescent reduce fat consumption by changing the type of milk consumed, from reduced-fat (2%), to low-fat (1%), to fat-free (skim) milk.
Encourage the child or adolescent to commit to behavior changes with contracts.	Discuss non-food rewards (incentives) to help the child or adolescent focus on changing eating behaviors.
Give the child or adolescent responsibility for changing and monitoring eating behaviors.	Stress the importance of planning how the child or adolescent will make and track changes in eating behavior. Make record-keeping simple, and review the plan with the child or adolescent.

TOOL G: STRATEGIES FOR HEALTH PROFESSIONALS TO PROMOTE HEALTHY EATING BEHAVIORS, CONTINUED

STRATEGIES	APPLICATIONS/QUESTIONS
Help the child or adolescent obtain family and peer support.	Discuss how the child or adolescent can encourage parents and peers to help. Meet with parents to clarify goals and action plans; determine how they can help. Provide nutrition education or counseling to parents, as appropriate.
Offer feedback and reinforce successes.	Show interest to encourage continued behavior change.
General Strategies	
Ask the child or adolescent about changes in eating behaviors at every visit.	"How are you doing in changing the way you eat?"
Emphasize to the child or adolescent the consumption of foods rather than nutrients.	For example, say, "drink more milk, and eat more cheese, and yogurt" rather than "you need more calcium."
Build on positive aspects of the child's or adolescent's eating behaviors.	"It's great that you're eating breakfast. Would you be willing to try cereal, fruit, and toast instead of bacon and doughnuts 4 days a week?"
Focus on "how to" instead of "why" information.	Share behaviorally oriented information (eg, what, how much, and when to eat and how to prepare food) rather than focusing on why the information is important.
Provide counseling that integrates realistic behavior change into the child's or adolescent's lifestyle.	"I understand that your friends eat lunch at fast-food restaurants. Would it help you to learn how to make healthier food choices at these restaurants?"
Discuss how to make healthy food choices in a variety of settings.	Talk about how to choose foods in various settings such as fast-food and other restaurants, convenience stores, vending machines, and friends' homes.
Provide the child or adolescent with learning experiences and skills practice.	Practice problem-solving and role-playing (eg, having the child or adolescent ask the food server to hold the mayonnaise).
Introduce the concept of achieving balance and enjoying all foods in moderation.	"Your food record shows that after having pepperoni pizza for lunch yesterday, you ate a lighter dinner. That's a good way to balance your food intake throughout the day."
Make record-keeping easy, and tell the child or adolescent that you do not expect spelling, handwriting, and eating behaviors to be perfect.	"Be as accurate and honest as you can as you record your food intake. This record is a tool to help you think about how you eat."
Make sure that the child or adolescent hears what you are saying.	"What are you planning to work on before your next appointment?"
Make sure that you and the child or adolescent define terms in the same way to avoid confusion.	Discuss the definition of words that may cause confusion, such as "fat," "calories," "meal," and "snack."
When assessing food intake, keep in mind that a child's or adolescent's portion size may not be the same as a standard serving size.	Use food models or household cups and bowls to clarify serving sizes.

TOOL H

Basics for Handling Food Safely[1]

Safe food handling, cooking, and storage are essential to prevent food-borne illness. You can't see, smell, or taste harmful bacteria that may cause illness. In every step of food preparation, follow 4 guidelines to keep food safe.

- Clean—Wash hands and surfaces often.
- Separate—Don't cross-contaminate.
- Cook—Cook to proper temperatures.
- Chill—Refrigerate promptly.

SHOPPING

- Buy refrigerated or frozen items after selecting non-perishable food.
- Never buy meat or poultry in packaging that is torn or leaking.
- Never buy food after "sell-by," "use-by," or other expiration dates.

STORAGE

- Always refrigerate perishable food within 2 hours (1 hour when the temperature is above 90°F).
- Check the temperatures of your refrigerator and freezer with an appliance thermometer. The refrigerator should be at 40°F or below and the freezer at 0°F or below.
- Cook or freeze fresh poultry, fish, ground meat, and variety meat (eg, calf's tongue) within 2 days; cook or freeze other beef, veal, lamb, or pork within 3 to 5 days.
- Make sure perishable food such as meat and poultry is wrapped securely to maintain quality and to prevent meat juices from coming into contact with other food.
- To maintain quality when freezing meat and poultry in its original package, wrap the package again with foil or plastic wrap that is recommended for the freezer.
- In general, canned high-acid foods such as tomatoes, grapefruit, and pineapple can be stored for 12 to 18 months. Canned low-acid foods such as meat, poultry, fish, and most vegetables can be stored for 2 to 5 years if the can remains in good condition and has been kept in a cool, clean, and dry place. Discard cans that are dented, leaking, bulging, or rusted.

PREPARATION

- Always wash your hands with warm water and soap for 20 seconds before and after handling food.
- Don't cross-contaminate. Keep raw meat, poultry, fish, and their juices away from other food. After cutting raw meat, wash the cutting board, utensils, and countertops with hot, soapy water.
- Sanitize cutting boards, utensils, and countertops with a solution of 1 tablespoon of unscented, liquid chlorine bleach in 1 gallon of water.
- Marinate meat and poultry in a covered dish in the refrigerator.

THAWING

- Refrigerator: The refrigerator allows slow, safe thawing. Make sure thawing meat and poultry juices do not drip onto other food.
- Cold water: For faster thawing, place food in a leak-proof plastic bag and submerge the bag in cold tap water. Change the water every 30 minutes. Cook immediately after thawing.
- Microwave: For fastest thawing, use the microwave. Place food in cookware that is manufactured for use in the microwave and cover with a lid or microwave-safe plastic wrap to hold in moisture and provide safe, even heating. Cook meat, poultry, egg casseroles, and fish immediately after microwave thawing.

COOKING (MINIMAL INTERNAL TEMPERATURE)

- Beef, veal, and lamb steaks; roasts; and chops cooked to 145°F
- All cuts of pork cooked to 160°F
- Ground beef, veal, and lamb cooked to 160°F
- Poultry cooked to 165°F

SERVING

- Hot food should be held at 140°F or warmer.
- Cold food should be held at 40°F or colder.
- At buffets, keep food hot with chafing dishes, slow cookers, and warming trays. Keep food cold by nesting dishes in bowls of ice.
- Perishable food should not be kept at room temperature for more than 2 hours (1 hour when the temperature is above 90°F).

LEFTOVERS

- Discard any perishable food kept at room temperature for more than 2 hours (1 hour if the temperature was above 90°F).
- Place perishable food in shallow containers and immediately put it in the refrigerator or freezer for rapid cooling.
- Use cooked leftovers within 4 days.

REFREEZING

- Meat and poultry defrosted in the refrigerator may be refrozen before or after cooking. For meat thawed by other methods, cook before refreezing.

REFERENCE

1. US Department of Agriculture, Food Safety and Inspection Service. *Basics for Handling Food Safely.* Washington, DC: US Department of Agriculture, Food Safety and Inspection Service; 2006

TOOL I

Tips for Fostering a Positive Body Image Among Children and Adolescents

CHILD OR ADOLESCENT	PARENTS	HEALTH PROFESSIONAL
Look in the mirror and focus on your positive features, not your negative ones. Say something nice to your friends about how they look. Think about your positive traits that are not related to appearance. Look at magazines with a critical eye, and find out what photographers and graphic designers do to make models look the way they do. If you are overweight and want to lose weight, be realistic in your expectations, and aim for gradual change. Realize that everyone has a unique size and shape. If you have questions about your size or weight, ask a health professional.	Model healthy eating and physical activity behaviors, and avoid extreme eating and physical activity behaviors. Focus on non–appearance-related traits when discussing yourself and others. Praise your child or adolescent for academic and other successes. Analyze media messages with your child or adolescent. Show that you love your child or adolescent regardless of what he weighs. If your child or adolescent is overweight, don't criticize her appearance—offer support instead. Share with a health professional any concerns you have about your child's or adolescent's eating behaviors or body image.	Discuss changes that occur during adolescence. Assess weight concerns and body image. If a child or adolescent has a distorted body image, explore causes and discuss potential consequences. Discuss how the media negatively affects body image. Discuss normal variation in body sizes and shapes among children and adolescents. Educate parents, physical education instructors, and coaches about realistic and healthy body weights. Emphasize the positive characteristics (related to appearance and not related to appearance) of children and adolescents you see.

TOOL I: TIPS FOR FOSTERING A POSITIVE BODY IMAGE AMONG CHILDREN AND ADOLESCENTS, CONTINUED

CHILD OR ADOLESCENT	PARENTS	HEALTH PROFESSIONAL
		Take extra time with an overweight child or adolescent to discuss psychosocial concerns and weight control options. Refer children, adolescents, and parents with weight-control issues to a registered dietitian or other health professional.

TOOL J

Nutrition Resources

This tool identifies organizations that may provide additional assistance. General nutrition resources are listed first, followed by resources for specific nutrition issues and concerns.

GENERAL NUTRITION RESOURCES

American Academy of Family Physicians
11400 Tomahawk Creek Parkway
Leawood, KS 66211-2672
Shawnee Mission, KS 66207-1210
Phone: 913/906-6000, 800/274-2237
Web site: http://www.aafp.org

American Academy of Pediatrics
141 Northwest Point Boulevard
Elk Grove Village, IL 60007-1019
Phone: 847/434-4000
Web site: http://www.aap.org

American College of Obstetricians and Gynecologists
409 12th Street SW
Washington, DC 20090-6920
Phone: 202/638-5577
Web site: http://www.acog.org

American Dietetic Association
120 South Riverside Plaza, Suite 2000
Chicago, Illinois 60606-6995
Phone: 800/877-1600
Web site: http://www.eatright.org

American Medical Association
515 North State Street
Chicago, IL 60654
Phone: 800/621-8335
Web site: http://www.ama-assn.org

American Nurses Association
8515 Georgia Avenue, Suite 400
Silver Spring, MD 20910-3492
Phone: 301/628-5000, 800/274-4262
Web site: http://www.ana.org

American Psychological Association
750 First Street NE
Washington, DC 20002-4242
Phone: 202/336-5500, 800/374-2721
Web site: http://www.apa.org

American Public Health Association
800 I Street NW
Washington, DC 20001-3710
Phone: 202/777-2742
Web site: http://www.apha.org

American School Health Association
Food and Nutrition Council
7263 State Route 43
Kent, OH 44240-0708
Phone: 330/678-1601
Web site: http://www.ashaweb.org

Association of State and Territorial Public Health Nutrition Directors
PO Box 1001
Johnstown, PA 15907-1001
Phone: 814/255-2829
Web site: http://www.astphnd.org

Center for Science in the Public Interest
1875 Connecticut Avenue NW, Suite 300
Washington, DC 20009-5728
Phone: 202/332-9110
Web site: http://www.cspinet.org

Food and Nutrition Board
Institute of Medicine
500 Fifth Street NW
Washington, DC 20001
Phone: 202/334-2352
Web site: http://www.iom.edu/CMS/3788.aspx

Food Research and Action Center
1875 Connecticut Avenue NW, Suite 540
Washington, DC 20009
Phone: 202/986-2200
Web site: http://www.frac.org

Health Resources and Services Administration Information Center
PO Box 2910
Merrifield, VA 22116
Phone: 888/275-4772
Web site: http://ask.hrsa.gov

International Food Information Council
1100 Connecticut Avenue NW, Suite 430
Washington, DC 20036
Phone: 202/296-6540
Web site: http://www.ific.org

International Life Sciences Institute
1156 15th Street NW, Suite 200
Washington, DC 20005-5802
Phone: 202/659-0074
Web site: http://www.ilsi.org

National Center for Education in Maternal and Child Health
Georgetown University
2115 Wisconsin Avenue NW, Suite 601
Washington, DC 20007-2292
Phone: 202/784-9770
Web site: http://www.mchlibrary.info

National Food Service Management Institute
The University of Mississippi
6 Jeanette Phillips Drive
PO Drawer 188
University, MS 38677-0188
Phone: 662/915-7658, 800/321-3054
Web site: http://www.nfsmi.org

National WIC Association
2001 S Street NW, Suite 580
Washington, DC 20009-3355
Phone: 202/232-5492
Web site: http://www.nwica.org

School Nutrition Association
120 Waterfront Street, Suite 300
National Harbor, MD 20745
Phone: 301/686-3100
Web site: http://www.asfsa.org

Society for Nutrition Education
9100 Purdue Road, Suite 200
Indianapolis, IN 46268
Phone: 317/328-4627, 800/235-6690
Web site: http://www.sne.org

US DEPARTMENT OF AGRICULTURE

Center for Nutrition Policy and Promotion
3101 Park Center Drive, 10th Floor
Alexandria, VA 22302-1594
Phone: 703/305-7600
Web site: http://www.usda.gov/cnpp

Expanded Food and Nutrition Education Program
1400 Independence Avenue SW, Stop 2201
Washington, DC 20250-2201
Phone: 202/720-4423
Web site: http://www.crees.usda.gov/nea/food/efnep/efnep.html

Food and Nutrition Service
3101 Park Center Drive
Alexandria, VA 22302
Phone: 703/305-2281
Web site: http://www.fns.usda.gov/fns

National Agricultural Library
Food and Nutrition Information Center
10301 Baltimore Avenue, Room 105
Beltsville, MD 20705-2351
Phone: 301/504-5414
Web site: http://fnic.nal.usda.gov

National Institute of Food and Agriculture
1400 Independence Avenue SW, Stop 2201
Washington, DC 20250-2201
Phone: 202/720-4423
Web site: http://www.csrees.usda.gov

US DEPARTMENT OF HEALTH AND HUMAN SERVICES

Centers for Disease Control and Prevention
1600 Clifton Road
Atlanta, GA 30333
Phone: 404/498-1515, 800/311-3435
Web site: http://www.cdc.gov

Indian Health Service
Office of Clinical and Preventive Services
The Reyes Building
801 Thompson Avenue, Suite 400
Rockville, MD 20852-1627
Phone: 301/443-4464
Web site: http://www.ihs.gov

Maternal and Child Health Bureau
5600 Fishers Lane
Parklawn Building, Room 18-05
Rockville, MD 20857
Phone: 301/443-2340
Web site: http://www.mchb.hrsa.gov

National Center for Health Statistics
3311 Toledo Road
Hyattsville, MD 20782
Phone: 800/232-4636
Web site: http://www.cdc.gov/nchs

National Institutes of Health

Division of Nutrition Research Coordination
6707 Democracy Boulevard, Room 624, MSC 5461
Bethesda, MD 20892-5461
Phone: 301/594-8822
Web site: http://dnrc.nih.gov

Eunice Kennedy Shriver National Institute of Child Health and Human Development
31 Center Drive
Building 31, Room 2A32, MSC 2425
Bethesda, MD 20892-2425
Phone: 800/370-2943
Web site: http://www.nichd.nih.gov

Office of Disease Prevention and Health Promotion
1101 Wootton Parkway, Suite LL100
Rockville, MD 20852
Phone: 240/453-8280
Web site: http://health.gov

US Food and Drug Administration
Center for Food Safety and Applied Nutrition
5100 Paint Branch Parkway
College Park, MD 20740-3835
Phone: 888/723-3366
Web site: http://www.cfsan.fda.gov

NUTRITION ISSUES AND CONCERNS

BREASTFEEDING

Academy of Breastfeeding Medicine
140 Huguenot Street, Third Floor
New Rochelle, NY 10801
Phone: 914/740-2115, 800/990-4226
Web site: http://www.bfmed.org

International Lactation Consultant Association
2501 Aerial Center Parkway, Suite 103
Morrisville, NC 27560
Phone: 919/861-5577, 888/452-2478
Web site: http://www.ilca.org

La Leche League International
PO Box 4079
Schaumburg, IL 60168-4079
Phone: 847/519-7730, 800/525-3243
Web site: http://www.lalecheleague.org

CHILDREN AND ADOLESCENTS WITH SPECIAL HEALTH CARE NEEDS

American Association on Intellectual and Developmental Disabilities
501 3rd Street NW, Suite 200
Washington, DC 20001
Phone: 202/387-1968, 800/424-3688
Web site: http://www.aamr.org

Easter Seals
233 South Wacker Drive, Suite 2400
Chicago, IL 60606
Phone: 312/726-6200, 800/221-6827
Web site: http://www.easter-seals.org

Family Voices
2340 Alamo SE, Suite 102
Albuquerque, NM 87106
Phone: 505/872-4774, 888/835-5669
Web site: http://www.familyvoices.org

March of Dimes
1275 Mamaroneck Avenue
White Plains, NY 10605
Phone: 914/997-4488
Web site: http://www.modimes.org

National Dissemination Center for Children with Disabilities
1825 Connecticut Avenue NW, Suite 700
Washington, DC 20009
Phone: 800/695-0285
Web site: http://www.nichcy.org

DIABETES MELLITUS

American Diabetes Association
1701 North Beauregard Street
Alexandria, VA 22311
Phone: 800/342-2383
Web site: http://www.diabetes.org

International Diabetes Center
Park Nicollet Clinic—St Louis Park
3800 Park Nicollet Boulevard
St Louis Park, MN 55416-2699
Phone: 952/993-3393, 888/825-6315
Web site: http://www.parknicollet.com/diabetes

National Diabetes Information Clearinghouse
1 Information Way
Bethesda, MD 20892-3560
Phone: 800/860-8747
Web site: http://diabetes.niddk.nih.gov/about/index.htm

National Institute of Diabetes and Digestive and Kidney Diseases
31 Center Drive, MSC 2560
Building 31, Room 9A06
Bethesda, MD 20892-2560
Phone: 301/496-3583
Web site: http://www2.niddk.nih.gov

EATING DISORDERS

National Eating Disorders Association
603 Stewart Street, Suite 803
Seattle, WA 98101
Phone: 206/382-3587
Web site: http://www.nationaleatingdisorders.org

FOOD ALLERGY

American Academy of Allergy, Asthma & Immunology
555 East Wells Street, Suite 1100
Milwaukee, WI 53202-3823
Phone: 414/272-6071
Web site: http://www.aaaai.org

The Food Allergy & Anaphylaxis Network
11781 Lee Jackson Highway, Suite 160
Fairfax, VA 22033-3309
Phone: 800/929-4040
Web site: http://www.foodallergy.org

National Institute of Allergy and Infectious Diseases
National Institutes of Health
6610 Rockledge Drive, MSC 6612
Bethesda, MD 20892-6612
Phone: 301/496-5717, 866/284-4107
Web site: http://www3.niaid.nih.gov

HUMAN IMMUNODEFICIENCY VIRUS

Elizabeth Glaser Pediatric AIDS Foundation
1140 Connecticut Avenue NW, Suite 200
Washington, DC 20036
Phone: 202/296-9165
Web site: http://www.pedaids.org

National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention
Centers for Disease Control and Prevention
1600 Clifton Road NE
Atlanta, GA 30333
Phone: 800/232-4636
Web site: http://www.cdc.gov/nchhstp

HYPERLIPIDEMIA

American Heart Association
National Center
7272 Greenville Avenue
Dallas, TX 75231
Phone: 800/242-8721
Web site: http://www.americanheart.org

National Heart, Lung, and Blood Institute
National Institutes of Health
31 Center Drive, MSC 2486
Building 31, Rom 5A48
Bethesda, MD 20892
Phone: 301/592-8573
http://www.nhlbi.nih.gov

HYPERTENSION

American Society of Hypertension
148 Madison Avenue, Fifth Floor
New York, NY 10016
Phone: 212/696-9099
Web site: http://www.ash-us.org

National Heart, Lung, and Blood Institute
National Institutes of Health
31 Center Drive, MSC 2486
Building 31, Rom 5A48
Bethesda, MD 20892
Phone: 301/592-8573
http://www.nhlbi.nih.gov

NUTRITION AND SPORTS

American Alliance for Health, Physical Education, Recreation and Dance
1900 Association Drive
Reston, VA 20191-1598
Phone: 800/213-7193
Web site: http://www.aahperd.org

American College of Sports Medicine
401 West Michigan Street
Indianapolis, IN 46206-3233
Phone: 317/637-9200
Web site: http://www.acsm.org

Disabled Sports USA
451 Hungerford Drive, Suite 100
Rockville, MD 20850
Phone: 301/217-0960
Web site: http://www.dsusa.org

National Recreation and Park Association
22377 Belmont Ridge Road
Ashburn, VA 20148
Phone: 800/626-6772
Web site: http://www.nrpa.org

National Sports Center for the Disabled
PO Box 1290
Winter Park, CO 80482
Phone: 303/316-1540, 970/726-1540
Web site: http://www.nscd.org

President's Council on Physical Fitness and Sports
1101 Wootton Parkway, Suite 560
Rockville, MD 20852
Phone: 240/276-9567
Web site: http://www.fitness.gov

Special Olympics
1133 19th Street NW
Washington, DC 20036
Phone: 202/628-3630, 800/700-8585
Web site: http://www.specialolympics.org

OBESITY

Action for Healthy Kids
4711 West Golf Road, Suite 625
Skokie, IL 60076
Phone: 800/416-5136
Web site: http://www.actionforhealthykids.org

Centers for Disease Control and Prevention
Division of Nutrition, Physical Activity, and Obesity
1600 Clifton Road
Atlanta, GA 30333
Phone: 800/232-6348
Web site: http://www.cdc.gov/nccdphp/dnpao

National Heart, Lung, and Blood Institute
National Institutes of Health
31 Center Drive, MSC 2486
Building 31, Rom 5A48
Bethesda, MD 20892
Phone: 301/592-8573
http://www.nhlbi.nih.gov

Weight-control Information Network
1 WIN Way
Bethesda, MD 20892-3665
Phone: 877/946-4627
Fax: 202/828-1028
Web site: http://win.niddk.nih.gov

ORAL HEALTH

American Academy of Pediatric Dentistry
211 East Chicago Avenue, Suite 1700
Chicago, IL 60611-2637
Phone: 312/337-2169
Web site: http://www.aapd.org

American Dental Association
211 East Chicago Avenue
Chicago, IL 60611-2678
Phone: 312/440-2500
Web site: http://www.ada.org

American Dental Hygienists' Association
444 North Michigan Avenue, Suite 3400
Chicago, IL 60611
Phone: 312/440-8900
Web site: http://www.adha.org

Vegetarian Eating Practices
The Vegetarian Resource Group
PO Box 1463
Baltimore, MD 21203
Tel: 410/366-8343
Fax: 410/366-8804
Web site: http://www.vrg.org

TOOL K

Federal Nutrition Assistance Programs

FOOD ASSISTANCE AND NUTRITION PROGRAMS	SERVICES AND BENEFITS	WHO QUALIFIES	FUNDING AND ADMINISTRATIVE AGENCIES	SERVICE PROVIDERS
Child and Adult Care Food Program (CACFP)	Reduced-price or free meals and snacks	Children and adolescents up to age 12; children and adolescents up to age 15 from families of migrant workers; children and adolescents up to age 18 who are residents of emergency shelters; and children and adolescents with a disablity (as defined by the state) enrolled in an institution, child care facility, or emergency shelter	US Department of Agriculture (USDA) State education agencies	Child care centers, day care homes, at-risk after-school care programs, and emergency shelters
Commodity Supplemental Food Program (CSFP)	Food	Infants and children up to age 6 from families with incomes ≤185% of the federal poverty level	USDA State agency (eg, health)	Local public and nonprofit private agencies
Early Head Start and Head Start	Nutrition services and meals and snacks (through the National School Lunch Program and the School Breakfast Program)	Infants and children up to age 5 and their families receiving public assistance or with incomes <100% of the federal poverty level; at least 10% of total enrollment available for infants and children with disabilities	Department of Health and Human Services (DHHS) DHHS regional offices	Local public and private nonprofit and for-profit agencies

TOOL K: FEDERAL NUTRITION ASSISTANCE PROGRAMS, CONTINUED

FOOD ASSISTANCE AND NUTRITION PROGRAMS	SERVICES AND BENEFITS	WHO QUALIFIES	FUNDING AND ADMINISTRATIVE AGENCIES	SERVICE PROVIDERS
Emergency Food Assistance Program (TEFAP)	Food	Varies by state	USDA State agency	Local public and nonprofit private agencies (eg, food banks, food pantries, soup kitchens)
Expanded Food and Nutrition Education Program (EFNEP)	Nutrition education	Children and adolescents from families with limited resources	USDA State land grant universities and Cooperative Extension Service offices	Local Cooperative Extension Service offices
Food Distribution Programs on Indian Reservations (FDPIR)	Food	Children and adolescents from families living on Indian reservations, and children and adolescents from Native American families residing in designated areas near reservations and in the state of Oklahoma with a family member who belongs to a federally recognized tribe; eligibility based on income and resource standards	USDA Indian tribal organizations and USDA, Food and Nutrition office	Indian tribes and tribal organizations
National School Lunch Program (NSLP)	Reduced-price or free lunches and afternoon snacks	Children and adolescents attending school: reduced-price lunches and snacks are available if family income is between 130% and 185% of the federal poverty level; free lunches and snacks available if income ≤130% of federal poverty level	USDA State education agencies	Public and private nonprofit schools and residential child care institutions
Nutrition Assistance Program (NAP) for Puerto Rico	Cash to purchase food	Children and adolescents from families with household resources (aside from income) of ≤$2,000 (≤$3,000 if household has at least one person age ≥60) living in Puerto Rico	USDA	Puerto Rico

TOOL K: FEDERAL NUTRITION ASSISTANCE PROGRAMS, CONTINUED

FOOD ASSISTANCE AND NUTRITION PROGRAMS	SERVICES AND BENEFITS	WHO QUALIFIES	FUNDING AND ADMINISTRATIVE AGENCIES	SERVICE PROVIDERS
School Breakfast Program	Reduced-price or free breakfasts	Children and adolescents attending school; same eligibility criteria as NSLP	USDA State education agencies	Public and private nonprofit schools and residential child care institutions
Special Milk Program (SMP)	Reduced-price or free milk	Children and adolescents attending child care programs, schools, and summer camps that do not participate in other federal meal-service programs; same eligibility criteria as NSLP	USDA State education agency	Child care programs, schools, and summer camps
Supplemental Nutrition Assistance Program (SNAP)	Benefits to purchase food	Children and adolescents from families with household resources (aside from income) of ≤$2,000 (≤$3,000 if household has at least one person age ≥60)	USDA State agency (eg, welfare, social services, and human services)	Public assistance and social services agencies, cooperative extension nutrition networks, and public health departments
Special Supplemental Nutrition Program for Women, Infants and Children (WIC)	Food, vouchers for food, nutrition education, and referral to health and social services	Infants and children up to age 5 at nutrition risk from families with incomes ≤185% of federal poverty level	USDA State agency (eg, health)	Health, social services, and community agencies
Summer Food Service Program (SFSP)	Reduced-price or free meals and snacks	Children and adolescents attending a summer activity program; same eligibility criteria as NSLP	USDA State education agency	Public and private nonprofit schools and nonresidential institutions; local, municipal, county governments; and summer camps

SUGGESTED READING

Boyle MA, Holben DH. *Community Nutrition in Action: An Entrepreneurial Approach.* 5th ed. Pacific Grove, CA: Brook Cole Publishing Company; 2009

Edelstein S. *Nutrition in Public Health: A Handbook for Developing Programs and Services.* 3rd ed. Sudbury, MA: Jones &Bartlett Publishers; 2010

US Department of Agriculure, Cooperative State Research, Education, and Extension Service. *Expanded Food and Nutrition Education Program.* USDA Web site. http://www.csrees.usda.gov/nea/food/efnep/efnep.html

US Department of Agriculture, Food and Nutrition Service. *Child & Adult Care Food Program.* USDA Web site. http://www.fns.usda.gov/cnd/Care/CACFP/aboutcacfp.htm

US Department of Agriculture, Food and Nutrition Service. *Commodity Supplemental Food Program* [fact sheet]. 2010. http://www.fns.usda.gov/fdd/programs/csfp/pfs-csfp.pdf

US Department of Agriculture, Food and Nutrition Service. *The Emergency Food Assistance Program* [fact sheet]. 2009. http://www.fns.usda.gov/fdd/programs/tefap/pfs-tefap.pdf

US Department of Agriculture, Food and Nutrition Service. *Food Distribution Program on Indian Reservation.* USDA Web site. http://www.fns.usda.gov/fdd/programs/fdpir

US Department of Agriculture, Food and Nutrition Service. *Supplemental Nutrition Assistance Program: Eligibility.* USDA Web site. http://www.fns.usda.gov/fsp/applicant_recipients/eligibility.htm

US Department of Agriculture, Food and Nutrition Service. *Supplemental Nutrition Assistance Program: Frequently Asked Questions.* USDA Web site. http://www.fns.usda.gov/fsp/faqs.htm

US Department of Agriculture, Food and Nutrition Service. *National School Lunch Program* [fact sheet]. 2009. http://www.fns.usda.gov/cnd/Lunch/AboutLunch/NSLPFactSheet.pdf

US Department of Agriculture, Food and Nutrition Service. *Nutrition Assistance Block Grants (NABG).* USDA Web site. http://www.fns.usda.gov/cga/FactSheets/NABGP_Quick_Facts.htm

US Department of Agriculture, Food and Nutrition Service. *Special Milk Program.* USDA Web site. http://www.fns.usda.gov/cnd/Milk

US Department of Agriculture, Food and Nutrition Service. *Summer Food Service Program.* USDA Web site. http://www.fns.usda.gov/cnd/Summer

US Department of Agriculture, Food and Nutrition Service. *WIC: The Special Supplemental Nutrition Program for Women, Infants and Children* [fact sheet]. 2009. http://www.fns.usda.gov/wic/WIC-Fact-Sheet.pdf

US Department of Health and Human Services, Administration for Children and Families, Office of Head Start. *About Office of Head Start.* HHS Web site. http://www.acf.hhs.gov/programs/ohs

Nutrition Supervision

Infancy

Infancy

CONTEXT

Infancy is a period marked by the most rapid growth and physical development experienced throughout life. Infancy is divided into several stages, each of which is unique in terms of growth, developmental achievements, nutrition needs, and feeding patterns. The most rapid changes occur in early infancy, between birth and age 6 months. In middle infancy, from ages 6 to 9 months, and in late infancy, from ages 9 to 12 months, growth slows but still remains rapid.

During the first year of life, good nutrition is key to infants' vitality and healthy development. But feeding infants is more than simply offering food when they are hungry, and it serves purposes beyond supporting their growth. Feeding also provides opportunities for emotional bonding between parents and infants.

Feeding practices serve as the foundation for many aspects of family development (ie, all members of the family—parents, grandparents, siblings, and the infant—develop skills in responding appropriately to one another's cues). These skills include identifying, assessing, and responding to infant cues; promoting reciprocity (infant's responses to parents, grandparents, and siblings and parents', grandparents', and siblings' responses to the infant); and building the infant's feeding and pre-speech skills. When feeding their infant, parents gain a sense of responsibility, experience frustration when they cannot interpret the infant's cues, and develop the ability to negotiate and solve problems through their interactions with the infant. They also expand their abilities to meet their infant's needs.

GROWTH AND PHYSICAL DEVELOPMENT

For infants to grow at appropriate rates, they need adequate calories and essential nutrients. Conversely, poor growth is an important indicator of nutritional inadequacy.

Immediately after birth, infants lose approximately 10% of their body weight because of fluid loss and some breakdown of tissue. They usually regain their birth weight within 7 days. Typically, infants double their birth weight by age 4 to 6 months and triple it by age 1. On average, infants gain 4 to 7 oz per week in the first 4 to 6 months and 3 to 5 oz per week from ages 6 to 18 months. Infants usually increase their length by 50% in the first year of life, but the rate of increase slows during the second half of the year. From birth to age 6 months, infants gain approximately 1 inch a month, and from ages 6 to 12 months, they gain about a half inch a month.

Growth rates of exclusively breastfed and formula-fed infants differ. Breastfed infants grow more rapidly during the first 6 months of life but less rapidly during the remainder of the first year.[1–3] Infants' growth depends on nutrition, perinatal history, genetic factors (eg, parental height, genetic syndromes, disorders), and other physical factors.

To meet growth demands, infants require a high intake of calories and adequate intakes of fat, protein, vitamins, and minerals. During the first year of life, breast milk, infant formula, or a combination of both provide 40% to 50% of calories from fat and are thus

important sources of calories, essential fatty acids, and fat-soluble vitamins. Fats should not be restricted during the first year of life.[4] For full-term infants, breast milk from a well-nourished mother offers enough vitamins and minerals, with the exception of vitamin D, during the first 6 months. Infants who are born at term usually have sufficient iron stores for 4 to 6 months. However, since breast milk contains very little iron, breastfed infants are at risk of iron deficiency by age 6 months and should receive an iron supplement beginning at age 4 months.[5] Ideally, mothers should exclusively breastfeed for a minimum of 4 months, but preferably for 6 months.[6] Formula, when correctly prepared and given in adequate volume, provides sufficient amounts of all nutrients, including vitamins and minerals. Complementary (solid) foods can be introduced between ages 4 and 6 months when the infant is developmentally ready. After age 6 months, solid foods aid in the development of appropriate feeding and eating skills for all infants and provide additional nutrients to meet the Dietary Reference Intakes for breastfed infants.

Significant developmental changes that occur in the first year of life have a profound effect on the way infants feed. Newborns are able to locate the mother's breast, latch onto the nipple, and suck to receive colostrum and then milk. At about age 4 to 6 months, infants are developmentally ready (ie, when the tongue thrust reflex [pushing food out of the mouth] is fading, their sucking reflex has changed to allow more coordinated swallowing, they can sit with support, and they have good head and neck control) to eat complementary foods. Over the next few months, they learn to chew and swallow, manipulate finger foods, drink from a cup, and ultimately feed themselves. In late infancy, infants' physical maturation, mastery of purposeful activity, and loss of newborn reflexes allow them to eat a wider variety foods, including foods with different textures, than they were able to consume during early and middle infancy.[7]

As infants grow, their ability to consume a greater volume and variety of food increases. Thus newborns need small, frequent feedings, whereas older infants are able to consume more volume at one time and require fewer feedings. Newborns' digestive systems can effectively digest breast milk or specifically designed infant formula. By age 3 months, an infant's digestive system has matured enough to allow the absorption of more complex foods.

For most infants, the first primary tooth appears at around age 6 months. Teeth erupt every few months, usually in right and left pairs alternating between the upper and lower jaws, and proceeding from the front of the mouth to the back. These first teeth, however, do not change how infants process food, because infants usually gum their food even if they have front teeth.

During infancy, the amount and type of physical activity that an infant engages in changes dramatically. At first, infants spend most of their time sleeping and eating. Activity begins with reflexes that promote the infant's survival. For example, the rooting reflex causes the infant to turn his mouth toward the breast or bottle and suckle. Over the next few months, these reflexes disappear, and infants slowly gain control over their movements. With increasing control comes more physical activity, including sitting up, rolling over, crawling, standing, and eventually walking.

Development is an individual process. Some infants sit earlier than others. Some walk as early as age 9 months, and others walk months after their first birthday. Although the order in which infants acquire motor skills is typically the same, the speed with which they acquire them is different. The ways infants are held and handled, the toys they play with, and their environments all influence their physical activity and motor skills development. Families that play with their infants, encouraging rolling, crawling, and then walking, are nurturing age-appropriate development.

DEVELOPMENTAL ISSUES

Infants need a nurturing environment and positive feeding patterns to promote healthy eating habits, learn to eat a balanced diet of varied foods, and learn to eat in moderation.

During the first year of life, feeding the hungry infant helps him learn to trust that his needs will be met. For optimal development, newborns should be fed as soon as possible when they express hunger. Parents must be careful observers of the infant's behavior, so that they can respond. The suck-and-pause sequence in breastfeeding or infant-formula feeding and behaviors such

as making eye contact, opening the mouth, and turning to the parent are an infant's first communication with her parents. As infants become more secure in their trust, they can wait longer for feeding. Infants should develop feeding skills at their own rate.

Difficulties in early feeding evoke strong emotions in parents and can undermine parenting confidence and parents' sense of competency. Thus feeding difficulties must be addressed in a timely manner. Over time, parents become more skilled at interpreting their infant's cues and increase their repertoire of successful responses to those cues. As they feed their infant, parents learn how their actions comfort and satisfy.

Close physical contact between the infant and a parent during feeding facilitates healthy social and emotional development. A sense of caring and trust evolves, which lays the groundwork for communication patterns throughout life.

A healthy feeding relationship involves a division of responsibility between the parent and the infant. The parent establishes a safe and nurturing feeding environment and provides appropriate, healthy foods. The infant decides when and how much to eat. In a healthy infant-parent feeding relationship, responsive parenting involves

- Responding early and appropriately to the infant's hunger and satiety cues
- Recognizing the infant's developmental abilities and feeding skills
- Balancing the infant's need for assistance with encouragement of self-feeding
- Allowing the infant to initiate and guide feeding interactions

BUILDING PARTNERSHIPS

Partnerships among health professionals, families, and communities are essential for ensuring that infants are well nourished and that parents receive guidance on infant nutrition and feeding. Health professionals can impact feeding decisions tremendously because they can provide parents with opportunities to discuss, reflect on, and decide on options that best suit their circumstances. As part of the guidance they offer, health professionals also can identify and contact community resources that help parents at each stage of their infant's development.

Health professionals are uniquely positioned to influence women in their decisions about whether to breastfeed. Health professionals should emphasize that breast milk is the ideal food for infants and should encourage breastfeeding whenever possible.[6] Breastfeeding provides infants with significant protection against a variety of infectious diseases, particularly in areas with poor sanitation and contaminated water and food supplies. Compared with formula-fed infants, breastfed infants have fewer and less-severe bacterial and viral diseases, including meningitis, gastroenteritis, otitis media, pneumonia, botulism, urinary tract infections, and necrotizing enterocolitis.[6] Even if the infant is breastfed for only a few weeks or months, the benefits are significant. Discussing the benefits of breastfeeding during prenatal care enables parents to make informed choices about whether and for how long to breastfeed their infant. Breastfeeding success is in large part dependent on health professionals' supportive attitudes, a hospital climate that is conducive to the initiation and maintenance of breastfeeding, and health professionals' awareness of the need for breastfeeding instruction and support.

Many hospitals, including those striving to meet the requirements of the World Health Organization and the UNICEF Baby-Friendly Hospital Initiative, are taking the following steps to promote and support breastfeeding[8]:

- Developing a written breastfeeding policy and communicating it to all health care staff
- Training staff members to ensure that they have the skills to implement the policy
- Educating pregnant women about the benefits and management of breastfeeding
- Initiating breastfeeding early
- Educating mothers on how to breastfeed and maintain lactation
- Limiting the use of any foods or beverages other than breast milk
- Having newborns stay in the mother's room
- Supporting mothers so that they can breastfeed their infants on demand
- Limiting the use of pacifiers
- Fostering breastfeeding support groups

Some workplaces are adapting to meet the needs of breastfeeding women. Certain employers offer longer breaks and a private setting for pumping

breast milk, refrigeration to safely store breast milk, and on-site child care so that mothers can breastfeed their infants during the workday.

Other nutrition resources may be available in the community. For parents, programs can focus on the importance of prenatal nutrition, the value and benefits of breastfeeding, and infants' nutrition needs. Health departments offer similar educational services through the Special Supplemental Nutrition Program for Women, Infants and Children (WIC) and other programs in which community health nurses or nutritionists visit families at home. Health maintenance organizations and community hospitals may also offer infant nutrition education.

The community may also supply financial resources to families to ensure that infants are adequately nourished. WIC offers a food package for pregnant, postpartum, and breastfeeding women and for infants and children up to age 5 from families with low incomes. Federally funded nutrition assistance programs can provide a substantial part of a child's daily nutrition requirements. (See Tool K: Federal Nutrition Assistance Programs.) A community food shelf or pantry can provide additional food for families in need. In some cases, infants may benefit from access to human breast milk banks. Families may also need assistance in procuring special equipment, such as breast pumps, special nipples, and bottles.

COMMON NUTRITION CONCERNS

Many parents need guidance from a health professional in deciding whether to feed their infant breast milk or infant formula. They want to be certain that their infant is receiving all the nutrients she needs, but they don't know whether breastfeeding or bottle feeding is best. Health professionals can help identify barriers to breastfeeding and provide referrals to lactation support services. Infants with special health care needs can be successfully breastfed, although mothers may need extra emotional support, instruction about special techniques for positioning, or special equipment to help overcome feeding problems. (See the Breastfeeding chapter.)

Health professionals should be aware of lactation specialists available in the area; tell parents about the benefits of using these specialists, even for mothers who have breastfed before, and provide referrals as appropriate. In many cases, lactation specialists provide follow-up care after the mother and infant are discharged from the hospital, consult with the mother by phone, and schedule follow-up visits in a hospital-based lactation clinic. They also offer suggestions to health professionals for use during follow-up visits. Moreover, lactation specialists help families manage breastfeeding when mothers return to work or when breastfeeding needs to be interrupted because of severe illness in the mother or infant or for other reasons. Breastfeeding support groups, such as La Leche League, may be available in the community. (See Tool J: Nutrition Resources.)

Parents may also need help determining when to introduce solid foods into the infant's diet. Health professionals can provide information related to the infant's nutrition needs and developmental abilities. Infants are developmentally ready to eat solid foods between ages 4 and 6 months. Between ages 6 and 12 months, infants master chewing, swallowing, and manipulation of finger foods; begin to use cups and utensils; and try foods with different tastes and textures.

Infants with special health care needs may have feeding challenges that raise concerns for parents. Resources are available to provide education and support for parents of infants with such needs. For infants with developmental disabilities, nutrition problems may be addressed as part of nutrition therapy in an early intervention program. (See the Children and Adolescents With Special Health Care Needs chapter.)

Nutrition Supervision

An infant's nutrition status should be evaluated during nutrition supervision visits or as part of health supervision visits. (For more information on health supervision, see *Bright Futures: Guidelines for Health Supervision of Infants, Children, and Adolescents,* listed under Suggested Reading in this chapter.)

Health professionals begin nutrition supervision by selectively asking interview questions about the infant's nutrition status, to invite discussion and build partnerships. Use of the questions may vary from visit to visit and from family to family. Questions can be modified to match the health professional's communication style. Gathering information can also be accomplished by reviewing a questionnaire filled out by parents before the visit. (See Tool A: Nutrition Questionnaire for Infants.) Additionally, to meet the challenge of providing nutrition supervision to diverse populations, health professionals need to appreciate the variety of cultural traditions related to food and the wide variation in food practices within and among cultural groups. (See the Cultural Awareness in Nutrition Services chapter.)

These methods provide a useful starting point followed by screening and assessment to identify an infant's nutrition concerns. The accompanying anticipatory guidance should be geared to address the family's questions and nutrition concerns for that particular infant and family. Health professionals provide anticipatory guidance to parents to offer information on the infant's nutrition status, to make parents aware of what to expect as the infant enters the next developmental period, and to foster the promotion of healthy eating behaviors. (See Tool G: Strategies for Health Professionals to Promote Healthy Eating Behaviors.)

Nutrition supervision information that pertains to the entire infancy developmental period (Nutrition Supervision Throughout Infancy) is provided first, followed by information for age-specific visits. Interview questions, screening and assessment, and anticipatory guidance should be used as appropriate and will vary from visit to visit and from infant to infant.

NUTRITION SUPERVISION THROUGHOUT INFANCY

Interview Questions

- How do you think feeding is going for you and your baby? Do you have any questions about feeding your baby?
- How does your baby let you know when she is hungry? How do you know when she has had enough to eat?
- How often do you feed your baby?
- Does your baby receive anything else besides breast milk or infant formula?
- How do you feel about the way your baby is growing?
- Are you concerned about having enough money to buy food?
- What is the source of your drinking and cooking water? Do you use bottled or processed water?

Screening and Assessment

- Assess the infant's growth. Measure the infant's length, weight, and head circumference, and plot these on a standard growth chart. Deviation from the expected growth pattern (eg, a major change in growth percentiles on the chart) should be evaluated. This may be normal or may indicate a nutrition problem (eg, feeding or eating difficulties, overfeeding).
- Evaluate the appearance of the infant's skin, hair, teeth, gums, tongue, and eyes.
- Assess the infant for age-appropriate development.
- Observe the parent-infant interaction, and assess parents' and infants' responses to one another (eg, affectionate, comfortable, distant, anxious).

Anticipatory Guidance

FOR PARENTS OF ALL INFANTS

Growth and Development

- Inform parents that the infant needs fat for growth and energy and that they should not restrict the infant's fat intake during the first year of life.[4] Between ages 2 and 6 months, body fat increases twice as much as muscle;

therefore, many infants seem chubby at age 6 months. Girls deposit a greater percentage of fat than boys. Between ages 6 and 12 months, however, infants gain more muscle and less fat, reducing the appearance of chubbiness.

- Reassure parents that infants develop feeding skills at their own rates. The infant must be ready before being introduced to new foods and textures. If the infant has significant delays in the development of feeding skills, refer parents to a specialist for further assessment.

Feeding Practices

- Tell parents that infants have special dietary needs because of their rapid growth and development.
- Inform parents that until the infant is age 12 months, breast milk or iron-fortified infant formula is recommended, and low-iron milk (eg, cow's, goat's, soy) should not be used, even in infant cereal.[4]
- Explain to parents that it is important to hold the infant close when feeding, in a semi-upright position, so that parents can assess the infant's cues of hunger, fullness, comfort, and distress. Parents should look into the infant's eyes during feeding.
- Emphasize to parents that breast milk is the ideal food for infants. Exclusive breastfeeding (only breast milk and prescribed medications offered to the infant) is recommended for a minimum of 4 months, but preferably for 6 months.[6]
- Instruct parents to feed the breastfed infant when he is hungry, typically 10 to 12 times per day during the initial weeks of life, 8 to 12 times per day for the next several months, and 6 to 12 times per day thereafter. Instruct parents to feed the formula-fed infant when she is hungry, typically every 3 to 4 hours (6–8 times per day) until complementary foods are added. For the younger infant (up to age 3 months), signs of hunger include putting his hand to his mouth, sucking, rooting, pre-cry facial grimaces, and fussing. For the older infant (ages 4–6 months), signs of hunger include moving her head forward to reach the spoon and swiping the food toward her mouth.
- Tell parents to feed the infant until he seems full. For the younger infant (age up to 3 months), signs of fullness include turning her head away from the nipple, showing interest in things other than eating, and closing her mouth. For the older infant (ages 4–6 months), signs of fullness include leaning back and turning away from the food.
- Reassure parents that it is normal for infants to spit up a little breast milk or formula at each feeding. Burping the infant several times during a feeding and avoiding excessive movement soon after a feeding may help. Encourage parents to burp the infant at natural breaks during feeding (eg, midway through the feeding) or after a feeding by gently rubbing or patting the infant's back while holding him against their shoulder and chest or while supporting him in a sitting position on their lap.
- Explain to parents that infants who are constipated (ie, who have hard, dry stools that are passed with difficulty) may not be getting enough breast milk or infant formula, may be receiving formula that is prepared incorrectly, or may be eating other foods too soon.[4]
- Instruct parents to introduce a cup for drinking at about age 6 months and to wean their infant from the bottle by age 12 to 14 months.
- Tell parents that juice should not be given to infants younger than 6 months. After age 6 months, provide 100% fruit juice in a cup instead of a bottle and limit it to 4 to 6 oz per day.[9]

Food Safety

- Instruct parents that expressed breast milk can be stored in an insulated cooler bag for 24 hours, in the refrigerator for 5 days, in the freezer compartment of a refrigerator for 2 weeks, in a freezer compartment of the refrigerator with separate doors for 3 to 6 months, and in a chest or upright deep freezer for 6 to 12 months.[10]
- Tell parents that an open container of ready-to-feed or concentrated infant formula can be kept up to 48 hours, if tightly covered and immediately placed in the refrigerator. Formula that is prepared from powder and placed in bottles should be refrigerated and used within 24 hours.[11]

- Instruct parents not to warm expressed breast milk, infant formula, or any food in containers or jars in a microwave. Breast milk warmed in a microwave can easily overheat or may heat unevenly (because of hotspots caused by microwaving), burning the infant and destroying the milk's beneficial qualities. Bottles can be warmed by holding them under hot running water or placing them in a bowl of hot water for a few minutes. Frozen breast milk should be thawed slowly either at room temperature, in the refrigerator, or in a warm-water bath. To make sure that the fluid isn't too warm, parents can sprinkle a few drops on their wrist (it should feel lukewarm). If necessary, they can wait for it to cool down and test it again.
- Emphasize to parents that choking can be a problem for infants because they may not have enough muscle control to chew and swallow foods properly. Parents need to be aware that infants can choke on foods that are small or slippery (eg, hard candy, whole grapes, hot dogs) and foods that are dry and difficult to chew (eg, popcorn, raw carrots, nuts). Foods that are sticky or tough to break apart (eg, peanut butter, large chunks of meat) can get lodged in the throat. In addition to being choking hazards, these foods are not appropriate for infants.[6]
- Inform parents that infants are at high risk for many food-borne illnesses because their immune and gastrointestinal systems are not fully developed. To reduce the risk for food-borne illness, parents need to follow food-safety practices. (See Tool H: Basics for Handling Food Safely.)

Supplements

- Explain to parents that breastfed and partially breastfed infants should receive a vitamin D supplement of 400 IU/day beginning in the first few days of life. Supplementation should continue unless the infant is weaned and is consuming at least 1 L/day or 1 qt/day of vitamin D–fortified formula or whole milk. Cow's milk should not be given to infants younger than 12 months.[12]
- Explain to parents that all non-breastfed infants who are ingesting less than 1 L/day or 1 qt/day of vitamin D-fortified formula should receive a vitamin D supplement of 400 IU/day beginning in the first few days of life.[12]
- Inform parents that although vitamin B_{12} deficiency is rare, a breastfed infant may need vitamin B_{12} supplements before age 6 months if the mother is vitamin B_{12} deficient (eg, if she is a vegan [eats no animal products], if she is undernourished and does not take B_{12} supplements).[4]

Oral Health

- Instruct parents to clean the infant's gums with a clean, moist washcloth or a soft-bristled toothbrush with a small head, preferably one designed for infants, and plain water twice a day. Brush the infant's teeth with fluoridated toothpaste as soon as the first tooth erupts, usually around age 6 to 10 months, twice a day (after breakfast and before bed). (See the Oral Health chapter.)
- Tell parents to hold the infant while feeding and to never prop a bottle (that is, use pillows or any other object to hold the bottle in the infant's mouth).
- Explain to parents that dental caries (tooth decay) may result from frequent or prolonged feedings or snacking on sugary or carbohydrate-rich foods. Explain to parents that their infant should not be put to sleep with a bottle or sipper-type ("sippy") cup or allowed frequent and prolonged bottle feedings or use of a sippy cup containing beverages high in sugar (eg, fruit drinks, soft drinks, fruit juice), breast milk, or formula during the day or at night to prevent sugary fluids from pooling around the teeth, which can increase the infant's risk for dental caries (tooth decay).[13]
- Discuss with parents that their own oral health has an impact on their infant's oral health because parents can transmit caries-promoting bacteria to their infant. It is important for parents to visit the dentist regularly, limit foods and beverages high in sugar, and practice good oral hygiene (ie, brushing their teeth twice a day with fluoridated toothpaste and flossing once a day).[13]

Physical Activity

- Discourage television viewing for children younger than 2, and encourage more interactive activities that promote proper brain development, such as talking and playing together.[14]

FOR PARENTS OF BREASTFED INFANTS

Feeding Practices

- Explain to parents that breastfeeding is recommended for infants during at least the first year of life because of its benefits related to infant nutrition, gastrointestinal function, host defense, neurodevelopment, and psychological well-being. (See the Breastfeeding chapter.)
- Tell parents that breastfeeding an infant exclusively for at least 4 months but preferably 6 months provides ideal nutrition and supports the best possible growth and physical development.[6]
- Inform parents that breastfeeding can continue for 12 months or as long as the mother and child wish to continue.[6]
- Explain to parents that breastfeeding can be more relaxing if the mother has a quiet place to breastfeed. The feeding position should be comfortable and the experience nurturing for the infant.
- Explain to parents that the longer an infant sucks, the more breast milk the mother's body will make. Feeding the infant on demand is the best way to stimulate lactation. Manually expressing breast milk or using a breast pump when the mother is away from her infant is recommended to increase or maintain the milk supply.
- Emphasize to parents that the infant should be allowed to finish feeding at one breast before the other breast is offered. The length of feedings should not be restricted, although 20 to 45 minutes per feeding generally provides adequate intake and allows the mother some time to rest between feedings.
- Inform mothers that infants typically need to be fed 10 to 12 times in 24 hours during the early weeks of lactation. Crying is a late sign of hunger that often interferes with good breastfeeding; the crying infant usually requires calming before breastfeeding can begin. In the first 2 to 4 weeks, infants should not be allowed to sleep more than 4 hours without breastfeeding.
- Explain to parents that infants have periods when they grow very fast. At these times, it may be necessary to feed them more often to give the mother's milk production a chance to adjust to the infant's needs. Frequent feedings help establish milk supply and prevent the breasts from getting too full.
- Instruct parents to introduce pureed meats that are rich in iron (eg, lean beef, pork, chicken, turkey) when complementary foods are introduced between ages 4 and 6 months to provide the infant with additional iron.[4]
- Emphasize to parents that an infant weaned from breast milk before age 12 months needs iron-fortified infant formula rather than cow's milk.[6]

Maternal Eating Behaviors

- Tell mothers to eat a variety of healthy foods. Eating well helps the mother stay healthy and the infant grow. (See the Healthy Eating and Physical Activity chapter.)
- Encourage mothers to drink liquids such as milk or juice when they are thirsty and to drink a glass of water at every feeding.
- Tell mothers to limit the consumption of drinks containing caffeine (eg, coffee, tea, soft drinks) to 2 servings per day.[15]
- Explain to mothers that 8 oz of wine, 12 oz of beer, or 2 oz of hard liquor is safe if breastfeeding is then delayed for 2 hours.[15]

Support

- Explain to mothers that additional sources of breastfeeding information include friends and family, breastfeeding support groups, lactation consultants, and educational materials.
- Encourage fathers to help care for breastfed infants. The father can bring the infant to the mother when it is time to breastfeed. When the infant is finished breastfeeding, the father can cuddle the infant and help with burping, diapering, or bathing.
- Emphasize that mothers who are breastfeeding more than one infant may need to eat more, receive additional nutrition counseling, and have extra help at home.

FOR PARENTS OF FORMULA-FED INFANTS

Feeding Practices

- Explain to parents that iron-fortified infant formula is the recommended substitute for breast milk for feeding the full-term infant during the first year of life.[4]
- Explain to parents that they should not feed their infant cow's milk, goat's milk, soy milk, or low-iron formulas during the first year of life. Indications for use of soy-based formula include an infant fed a vegetarian diet or an infant with documented lactose intolerance.[4]
- Encourage parents to hold the infant close, in a semi-upright position, during feeding. The parent should be able to look into the infant's eyes.[4]
- Discuss with parents that they will need to prepare and offer more infant formula as the infant's appetite increases.
- Inform parents that infants do not usually need water, but water can be offered between feedings when the air temperature is high.[4]
- Instruct parents to check the following if the infant is crying more than usual or seems to want to eat all the time:
  - Is the infant placed in a semi-erect, comfortable position for feeding?
  - Is the formula prepared correctly? Has extra water been added?
  - Are parents responding to the infant's hunger cues?
  - Is the feeding environment too distracting?
- Tell parents not to enlarge the hole in the bottle nipple to make expressed breast milk or infant formula come out faster.
- If the infant is not feeding enough, parents should consult with a health professional.

Food Safety

- Tell parents to carefully prepare infant formula as instructed and to follow these sanitary procedures.[11]
  - Wash hands before preparing formula.
  - Clean the area where formula is prepared with a nontoxic biodegradable cleaner.
  - Clean and disinfect reusable bottles, caps, and nipples before every use.
  - Wash and dry the top of the formula container before opening.
- Emphasize to parents that cereal or other foods should not be added to infant formula.
- Tell parents to discard any formula left in the bottle when the infant has finished eating. A bottle that has been started should not be reused.[11]
- Inform parents that open containers of ready-to-feed or concentrated infant formula should be covered and refrigerated.[11]
- Inform parents that powdered infant formula can be stored at room temperature.

NUTRITION SUPERVISION BY VISIT

PRENATAL

Interview Questions

FOR PREGNANT WOMEN

- Are there any family health concerns that I should know about to better care for your baby and family?
- What was your pre-pregnancy weight? How much weight did you gain in prior pregnancies? How much weight have you gained until now?
- Tell me about your living situation. Do you have enough heat, hot water, and electricity? Do you have appliances that work?
- Do you have what you need to care for your baby? Do you feel comfortable caring for your baby? Do you have health insurance? Do you have enough money for food, clothing, diapers, and child care?
- Would you be interested in resources that would help you afford to care for yourself and your baby?
- Are you taking or do you plan to take prenatal vitamins? Are you taking other vitamins or minerals?
- Are you taking any prescribed or over-the-counter medications or pain relievers now, or have you taken any in the past?
- Have you used any special or traditional health remedies to improve your health since you have been pregnant?
- Do you drink alcohol or special teas, or take any herbs? Is there anything that you were taking but stopped using when you learned that you were pregnant?

- Are you using any other drugs (legal or illegal) or supplements?
- What are your plans for feeding your baby? What have you heard about breastfeeding? Do you have questions about breastfeeding?
- What kinds of experiences have you had feeding babies? With your own children? Other children? Your siblings?
- Are you restricting any foods in your diet because of lack of appetite, food aversions, vegan or vegetarian diets, weight gain, food allergies and sensitivities, or any other reason?
- Does anyone in your family have a history of food allergy or intolerance?
- What does your partner or family think about your plan for feeding?
- Do you have problems with your teeth? Does the water you drink contain fluoride?

FOR WOMEN PLANNING TO BREASTFEED

- Did you breastfeed your other children? How did that go?
- Do you have any worries about breastfeeding (eg, your diet, privacy, having enough breast milk, changes in your body)? Have you had any breast surgery?
- Have you been to any classes that taught you how to nurse your baby?
- Do you know anyone who breastfeeds her baby? Did any of your family or friends breastfeed? Would you be able to get help from them as you are learning to breastfeed?
- Do you know how to contact support groups or lactation consultants?

FOR PARENTS PLANNING TO FORMULA-FEED

- What have you read or heard about different infant formulas (eg, iron-fortified, soy, lactose-free)? Do you have any questions about formula feeding?
- Would you like help choosing formula for your baby?
- Are you worried about having enough money to buy infant formula?
- How do you plan to prepare the formula? What have you heard about formula safety?
- Do you have family members or friends who will help you feed your baby?

Anticipatory Guidance

- Explain to women the importance of maintaining health by going to all prenatal care appointments, getting enough sleep, and getting physical activity, as well as by eating healthy foods and gaining the right amount of weight.
- To minimize the risk for giving birth to an infant with a neural tube defect, encourage women to consume folic acid, particularly before pregnancy and during the first trimester of pregnancy. Before pregnancy, females should consume 400 μg per day of folic acid (the synthetic form of folate) from fortified foods and/or supplements in addition to consuming a variety of foods that contain folate. Once pregnancy is confirmed, recommended intake is 600 dietary folate equivalents per day of food folate, folic acid, or a mixture of both.[16]
- Inform women that concentrated sources of food folate include fruits (eg, oranges, strawberries, avocados); dark-green leafy vegetables (eg, spinach, turnip greens); some other vegetables (eg, asparagus, broccoli, brussels sprouts); and legumes (eg, black, pinto, navy, and kidney beans). Folic acid can be obtained from fortified food products (eg, fortified grain products, most ready-to-eat breakfast cereals).
- Tell women that resources are available to help them. They may be eligible for food, nutrition, or other assistance programs. Several federally funded nutrition assistance programs, such as the Commodity Supplemental Food Program and the Supplemental Nutrition Assistance Program, can help. (See Tool K: Federal Nutrition Assistance Programs.)
- Advise women planning for conception or who are pregnant to avoid consumption of alcoholic beverages because alcohol adversely affects fetal development.
- Encourage women to maintain good oral hygiene and obtain oral health care if needed. (See the Oral Health chapter.)
- Recommend to women moderate physical activity, such as gentle aerobics (eg, walking, swimming), as soon as possible after delivery to increase their energy level.
- Explain to women that weight loss after pregnancy should occur gradually by adjusting caloric intake, level of physical activity, or both.

FOR PARENTS PLANNING TO BREASTFEED

- Encourage parents to attend prenatal classes. In addition, many communities have lactation consultants and nurses who are available to assist with breastfeeding.
- Share information with women about the known effects on pregnant women of herbal or traditional health remedies. Explain that many herbal teas contain ephedra and other substances that may be harmful to the infant.
- Encourage mothers to consult with an obstetrician or another health professional about any herbal or traditional products that she is using.
- Assure women that most mothers are able to successfully breastfeed. Explain that infants with conditions that make breastfeeding challenging may still be breastfed and that a breastfeeding consultation and close monitoring can help.
- Inform mothers who plan to breastfeed or partially breastfeed that the infant will need a vitamin D supplement beginning in the first few days of life.[12]
- Emphasize to parents the need for a newborn visit with a health professional within 48 hours of discharge from the hospital to check the infant's feeding and weight status, monitor breastfeeding, and address questions and concerns.

FOR PARENTS PLANNING TO FORMULA-FEED

- Encourage parents to attend prenatal classes.
- Encourage parents to discuss the type of infant formula they plan to use and any proposed changes in formula.
- Review with parents the steps for preparing formula, and reinforce the need to carefully read the directions. Mixing directions differ among powdered formulas. Provide written information about how to safely prepare formula, including heating and cleaning bottles and nipples.
- Explain to parents that newborn infants who are formula-fed average 20 oz of formula per day. Tell parents to prepare 2 oz of infant formula every 2 to 3 hours at first and to then provide more if the infant still seems hungry.

NEWBORN

Health professionals should use the general information in the section Nutrition Supervision Throughout Infancy (pages 25–29), as well as the age-specific information that follows.

Interview Questions

FOR PARENTS OF ALL INFANTS

- How often does your baby feed? How long does it generally take for a feeding?
- How does he behave during a feeding? Pulls away, arches back, is irritable or calm?
- How does your baby behave after feedings? Satisfied baby look, still rooting, anxious?
- Has she received any other fluids from a bottle?
- How many wet diapers and stools does he have each day?
- Is anyone helping you feed your baby?
- What is the longest time your baby has slept at one time? How much rest are you getting?

FOR PARENTS OF BREASTFED INFANTS

- How is breastfeeding going for you and your baby?
- Do you need any help with breastfeeding?
- How often do you feed your baby? How do you know when he is hungry?
- How does your baby attach to your breast and suck? Do you hear her make swallowing sounds when you breastfeed?
- Have you had any problems with your breasts or nipples (eg, tenderness, swelling, pain)?
- Are you restricting any foods in your diet?
- What vitamin or mineral supplements do you take or plan to take? Is your baby receiving vitamin D supplements?
- Do you drink wine, beer, or other alcoholic beverages? Do you drink any special teas or take any herbs?
- Do you use any drugs (eg, prescription, over the counter, street drugs)?

FOR PARENTS OF FORMULA-FED INFANTS

- What formula are you using? Is the formula iron-fortified?
- How often do you feed your baby? How much does she take at a feeding?
- What questions do you have about infant formula (eg, brands, cost, preparation, amount)?

- How do you store the infant formula after you make it?
- How do you clean bottles, nipples, and other equipment?
- What do you do with the formula in the bottle after your baby has finished feeding?
- How does your baby like to be held when you feed him?
- Are you worried about having enough money to buy infant formula?

Screening and Assessment

- Perform metabolic screening as indicated by the state.
- Assess administration of vitamin K.

Anticipatory Guidance

FOR PARENTS OF ALL INFANTS

- Instruct parents on how to recognize an infant's hunger cues, which include putting her hand to her mouth, sucking, rooting, pre-cry facial grimaces, and fussing. Parents can avoid crying by responding to the infant's more subtle cues. Instruct parents to awaken the infant for feeding if she sleeps more than 4 hours at a time during the first 2 weeks.
- Inform parents that infants may be distracted by lights and noise and may need help to focus on feeding. A calm, gentle approach, using repetitive movements such as rocking, patting, or stroking, is usually most helpful. Some infants may need to be swaddled or fed in a room with less light and noise.

FOR PARENTS OF BREASTFED INFANTS

- Encourage women to begin breastfeeding as soon as possible after the infant is born, preferably in the delivery room.[6] (See the Breastfeeding chapter.)
- Instruct women to breastfeed when their infant shows signs of hunger (eg, increased alertness or activity, mouthing, rooting). Tell women not to wait until their infant is crying. Crying is a late sign of hunger that often interferes with good breastfeeding; the crying infant usually requires calming before breastfeeding can begin. Newborn infants usually are hungry every 2 to 3 hours and require about 8 to 12 feedings in 24 hours (throughout the day and night).[6]
- Reassure parents that breastfed infants are getting enough milk if they have about 6 to 8 wet diapers and 3 or 4 stools per day and are gaining weight at the appropriate rate.
- Tell parents to avoid using any artificial nipples (pacifiers, bottles) and supplements (unless medically indicated) until breastfeeding is well established. For most infants, this occurs around age 4 to 6 weeks.
- Encourage women who are considering combining breastfeeding and formula-feeding to wait until lactation is well established (usually at age 2–4 weeks) before introducing infant formula.

FOR PARENTS OF FORMULA-FED INFANTS

- Explain to parents that newborn infants who are formula-fed consume an average of 20 oz of formula per day. Tell parents to prepare 2 oz of infant formula every 2 to 3 hours at first and to then provide more if the infant still seems hungry.

3 TO 5 DAYS

Health professionals should use the general information in the section Nutrition Supervision Throughout Infancy (pages 25–29), as well as the age-specific information that follows.

Interview Questions

FOR PARENTS OF ALL INFANTS

- How is feeding going? What questions or concerns do you have?
- How are you feeding your baby?
- How often does your baby feed? How long does it generally take for a feeding?
- How does your baby like to be held when you feed her?
- Are you comfortable that your baby is getting enough to eat?
- How does she behave during a feeding? Pulls away, arches back, is irritable, or calm?
- How does your baby behave after feedings? Satisfied baby look, still rooting, anxious?
- Has she received any other fluids from a bottle?
- Is anyone helping you feed your baby?
- How many wet diapers and stools does he have each day?
- What is the longest time he has slept at one time?

FOR PARENTS OF BREASTFED INFANTS

- How is breastfeeding going for you and your baby?
- Is your baby receiving a vitamin D supplement?
- Does your baby suck well? Does he latch on well and breastfeed in a rhythm?
- Do you feel a good "let-down" or "milk-ejection" reflex (tingling sensation and a strong surge of milk)?
- Have you noticed changes in your milk?
- How often does your baby nurse? How long do feedings last?
- How can you tell whether he is satisfied at the breast?
- Are you offering your baby breast milk in a bottle?
- What over-the-counter or prescription medications are you taking?

FOR PARENTS OF FORMULA-FED INFANTS

- What formula are you using for your baby? Is it iron-fortified?
- How are you preparing the formula?
- How often do you feed your baby? How much does she take at a feeding?
- How do you hold your baby while feeding? How do you hold the bottle?
- How do you know if your baby is hungry? How does she let you know she has had enough to eat?
- What questions do you have about infant formula (eg, brands, cost, preparation, amount)?
- What questions do you have about preparing formula and storing it safely?
- Are you worried about having enough money to buy infant formula?

Screening and Assessment

- Perform metabolic screening as indicated by the state.
- Assess the infant for milk intake, hydration, jaundice, and age-appropriate elimination patterns.
- If possible, observe the mother breastfeeding or either parent bottle-feeding the infant. Assess how comfortable the parent seems with feeding the infant, eye contact between the parent and the infant, the parent's interaction with the infant, the parent's and infant's responses to distractions in the environment, and the infant's ability to suck.

Anticipatory Guidance

FOR PARENTS OF ALL INFANTS

- Instruct parents on how to recognize an infant's hunger cues, which include putting her hand to her mouth, sucking, rooting, pre-cry facial grimaces, and fussing. Crying is a late sign of hunger that often interferes with good breastfeeding; the crying infant usually requires calming before breastfeeding can begin. Parents can avoid crying by responding to the infant's more subtle cues. Instruct parents to awaken the infant for feeding if she sleeps more than 4 hours at a time during the first 2 weeks. Explain that keeping her close by will make it easier to recognize the early hunger cues.
- Inform parents that infants may be distracted by lights and noise and may need help to focus on feeding. A calm, gentle approach, using repetitive movements such as rocking, patting, or stroking, is usually most helpful. Some infants may need to be swaddled or fed in a room with less light and noise.

FOR PARENTS OF BREASTFED INFANTS

- Tell parents that at about age 1 week, the infant should settle into a more typical breastfeeding routine of every 2 to 3 hours in the daytime and every 3 hours at night, with one longer 4- to 5-hour stretch between feedings, for a total of 10 to 12 feedings in 24 hours.
- Inform parents that breastfed infants should have about 6 to 8 wet diapers in 24 hours after the mother's milk comes in. Infants may have stools as frequently as one per feeding or may go for several days without a stool. Breastfed infants' stools are loose. This is normal and is not diarrhea.
- Tell parents to avoid using any artificial nipples (pacifiers, bottles) and supplements (unless medically indicated) until breastfeeding is well established. For most infants, this occurs around age 4 to 6 weeks. Some infants never use pacifiers or bottles.

FOR PARENTS OF FORMULA-FED INFANTS

- Explain to parents that infants who are formula-fed average 20 oz of formula per day. Tell parents to prepare 2 oz of infant formula every 2 to 3 hours at first and to then provide more if the infant still seems hungry.

BY 1 MONTH

Health professionals should use the general information in the section Nutrition Supervision Throughout Infancy (pages 25–29), as well as the age-specific information that follows.

Interview Questions

FOR PARENTS OF ALL INFANTS

- How is feeding going? What questions or concerns do you have?
- What are you feeding your baby at this time?
- How often are you feeding him during the day? During the night?
- How do you know if he is hungry? How do you know if he has had enough?
- Have you given your baby anything other than infant formula?
- Have there been times when he seemed to be growing very fast and seemed to want to eat all the time? What did you do?
- Is anyone helping you feed him?
- How easily does your baby burp during or after a feeding?
- How many wet diapers and stools does your baby have each day?
- What is the longest time your baby has slept?
- Are you giving your baby any supplements, herbs, or vitamins?

FOR PARENTS OF BREASTFED INFANTS

- How is breastfeeding going for you and your baby?
- Do you need any help with breastfeeding?
- Are you breastfeeding exclusively? If not, what else is he getting?
- How often do you feed your baby? How long do you feed him each time?
- Does it seem as though your baby is breastfeeding more often or for longer periods?
- In what ways is breastfeeding different now from when you were last here?
- How can you tell if your baby is satisfied at the breast?
- Has your baby received breast milk or other fluids from a bottle?
- Are you planning to return to work or school? If so, are you pumping your breast milk? How do you store it? How long do you keep it?

FOR PARENTS OF FORMULA-FED INFANTS

- How do you hold your baby when you feed her?
- Do you ever prop a bottle to feed or put him to bed with a bottle?
- How is formula feeding going for you and your baby?
- What formula do you use? Is the formula iron-fortified?
- How do you prepare the formula?
- How often does your baby feed? How much does he take at a feeding?
- How long does it take to feed your baby?
- Have you given your baby anything other than formula?
- What concerns do you have about the formula (eg, cost, preparation, nutrient content)?
- What do you do with milk left in the bottle after he has finished eating?
- Are you worried about having enough money to buy infant formula?

Screening and Assessment

- If possible, observe the mother breastfeeding or either parent bottle-feeding the infant. Assess how comfortable the parent seems with feeding the infant, eye contact between the parent and the infant, the parent's interaction with the infant, the parent's and infant's responses to distractions in the environment, and the infant's ability to suck. Help the parents and the infant develop successful feeding behaviors. Assess the need for neurologic evaluation if the infant stiffens during feeding, continues to exhibit oral reflexes such as rooting, experiences delays in learning feeding skills, or has difficulty swallowing.
- For breastfed infants, determine whether the infant is receiving vitamin D supplements.

Anticipatory Guidance

FOR PARENTS OF ALL INFANTS

- Explain to parents that infants often go through growth spurts between ages 6 and 8 weeks and significantly increase their milk intake during that time. For formula-fed infants, parents will need to prepare and offer more infant formula as the infant's appetite increases.

- Emphasize to parents that infants should not be offered food other than breast milk or infant formula until they are developmentally ready (ie, when the tongue thrust reflex [pushing food out of the mouth] is fading, their sucking reflex has changed to allow more coordinated swallowing, they can sit with support, and they have good head and neck control).
- Inform parents that infants may be distracted by lights and noise and may need help to focus on feeding. A calm, gentle approach, using repetitive movements such as rocking, patting, or stroking, is usually most helpful. Some infants may need to be fed in a room with less light and noise. Feeding times offer a wonderful opportunity for social interaction between the infant and the parent.
- Tell parents that if the infant cries inconsolably for several hours each day and passes a lot of gas, he may have colic. If the infant is breastfeeding, short, frequent feedings are recommended.
- Suggest that parents play with the infant, encouraging her to follow objects with her eyes. Playing stimulates the nervous system and helps infants develop head and neck control and motor skills.

FOR PARENTS OF BREASTFED INFANTS

- Inform parents that their infant is getting enough milk if he has about 6 to 8 wet diapers and 3 or 4 stools per day and is gaining weight at the appropriate rate. The number of stools may decrease and, by age 6 weeks, breastfed infants may have stools as infrequently as every 3 days.
- Explain to parents that breastfed infants need a vitamin D supplement beginning in the first few days of life.[12]
- Tell parents that if they wish to introduce a bottle to their infant, they should pick a time when the infant is neither extremely hungry nor full. Suggest that someone other than the mother offer the infant the bottle. Tell parents to allow the infant to explore the bottle's nipple and take it in his mouth.

FOR PARENTS OF FORMULA-FED INFANTS

- Explain to parents that 1-month-old infants usually consume 24 to 27 oz of formula in 24 hours, but may consume 20 to 31 oz. Infants need to feed every 3 to 4 hours.

2 MONTHS

Health professionals should use the general information in the section Nutrition Supervision Throughout Infancy (pages 25–29), as well as the age-specific information that follows.

Interview Questions

FOR PARENTS OF ALL INFANTS

- How is your baby's feeding going? What questions or concerns do you have?
- Tell me about all the foods you are offering your baby.
- Is anyone helping you feed her?
- What is the longest time your baby has slept?
- Have there been times when she seemed to be growing very fast and seemed to want to eat all the time? What did you do?
- How easily does your baby burp during or after a feeding?

FOR PARENTS OF BREASTFED INFANTS

- How is breastfeeding going for you and your baby?
- Do you need any help with breastfeeding?
- Are you giving your baby any supplements (eg, vitamin D)?
- Does your baby receive other foods or fluids besides breast milk?
- How often do you feed your baby? How long do you feed him each time?
- Does it seem like your baby is breastfeeding more often or for longer periods?
- In what ways is breastfeeding different now from when you were last here?
- How can you tell if your baby is satisfied at the breast?
- Has your baby received breast milk or other fluids from a bottle?
- Are you planning to return to work or school? If so, will you pump your breast milk?
- Does your school or workplace have a place where you can pump your milk in privacy? How will you store your milk? How long will you keep it?

FOR PARENTS OF FORMULA-FED INFANTS

- How is formula-feeding going for you and your baby?
- How are you preparing the formula?
- What formula do you use? Is the formula fortified with iron?

- How often does your baby feed? How much does she drink at a feeding?
- About how long does a feeding last? Have you offered her anything other than formula?
- How do you hold your baby when you feed him?
- Do you ever prop a bottle to feed her or put her to bed with a bottle?
- What do you do with formula left in the bottle after your baby has finished eating?
- Are you worried about having enough money to buy infant formula?

Screening and Assessment

- Observe how responsive the parents and the infant are to each other (eg, gazing, talking, smiling, holding, cuddling, comforting, showing affection).
- If possible, observe the mother breastfeeding or bottle-feeding the infant. Assess how comfortable the parent seems with feeding the infant, eye contact between the parent and the infant, the parent's interaction with the infant, the parent's and infant's responses to distractions in the environment, and the infant's ability to suck. Help the parents and the infant develop successful feeding behaviors.
- For breastfed infants, determine whether the infant is receiving vitamin D supplements.

Anticipatory Guidance

FOR PARENTS OF ALL INFANTS

- Explain to parents that as infants grow, they are more easily distracted during feeding and may need gentle, repetitive stimulation (eg, rocking, patting, stroking). Infants may need a quiet environment, perhaps with low lighting and without other people present. Feeding times offer a wonderful opportunity for social interaction between the infant and the parent.
- Tell parents that if the infant cries inconsolably for several hours each day and passes a lot of gas, he may have colic. If the infant is breastfeeding, short, frequent feedings are recommended.
- Emphasize to parents that infants should not be offered food other than breast milk or infant formula until they are developmentally ready (ie, at about age 4–6 months, when their sucking reflex has changed to allow coordinated swallowing, they can sit with support, and they have good head and neck control).
- Explain to parents that adding cereal to the infant's diet will not help the infant sleep through the night.
- Suggest that parents play with the infant, encouraging him to follow objects with his eyes. Playing stimulates the nervous system and helps infants develop head and neck control and motor skills. Tummy time should be encouraged because it promotes head control and appropriate gross motor development.

FOR PARENTS OF BREASTFED INFANTS

- Congratulate the mother for continuing to breastfeed!
- Emphasize to parents that breastfed infants continue to need 8 to 12 feedings in 24 hours (throughout the day and night). They may feed more frequently when they go through growth spurts. By age 3 months, breastfed infants generally feed every 2 to 3 hours but may have one longer stretch of 4 to 5 hours at night between feedings.
- Reassure parents that breastfed infants ages 6 weeks and older may have stools as infrequently as every 3 days.

FOR PARENTS OF FORMULA-FED INFANTS

- Explain to parents that 2-month-old infants usually consume 26 to 28 oz of formula in 24 hours, but they may consume 21 to 32 oz. Infants feed every 3 to 4 hours, with one longer stretch at night of up to 5 or 6 hours between feedings.

4 MONTHS

Health professionals should use the general information in the section Nutrition Supervision Throughout Infancy (pages 25–29), as well as the age-specific information that follows.

Interview Questions

FOR PARENTS OF ALL INFANTS

- How is feeding going? What questions or concerns do you have?
- Tell me about what you are feeding your baby. How often are you feeding him?
- How much does she take at a feeding? About how long does a feeding last? Are you feeding your baby any foods besides breast milk or formula?
- Have you thought about when you will begin to give your baby solids?

- Does your baby seem interested in your food?
- Have you offered him foods from the family meal? If so, which ones?
- In addition to feeding her at home, where else is she fed (eg, at child care, at a relative's home)?

FOR PARENTS OF BREASTFED INFANTS

- How is breastfeeding going for you and your baby?
- In what ways is breastfeeding different now from when you were last here?
- How often does your baby breastfeed? About how long does a feeding last?
- Is your baby breastfeeding more often or for longer periods?
- How can you tell whether she is satisfied at the breast?
- Has she received breast milk or other fluids from a bottle?
- Are you giving your baby any supplements (eg, iron, vitamin D)?
- Are you planning to return to work or school? If so, are you pumping your breast milk? How are you storing pumped breast milk? How long do you keep it?

FOR PARENTS OF FORMULA-FED INFANTS

- How is feeding going? What formula are you using now?
- Is the formula fortified with iron? Have you tried other formulas?
- How are you preparing the formula?
- How often does your baby feed? How much at a feeding? How much in 24 hours?
- Has your baby begun to put his hands around the bottle?
- Are you still holding your baby for feedings?
- What do you do with infant formula left in the bottle when he has finished feeding?
- Have you offered your baby anything other than infant formula?
- Are you worried about having enough money to buy infant formula?

Screening and Assessment

- For breastfed infants, determine whether the infant is receiving vitamin D supplements and whether the infant is receiving any iron-containing foods or supplements.

Anticipatory Guidance

FOR PARENTS OF ALL INFANTS

- Explain to parents that infants can now clearly show when they are hungry (by moving the head forward to reach the bottle or spoon) or full (by leaning back and turning away from food). It is important to respond to the infant's behaviors for feeding to avoid overfeeding (which can cause spitting up) or underfeeding.
- Emphasize to parents that infants should not be offered food other than breast milk or infant formula until they are developmentally ready (ie, between ages 4–6 months, when the tongue thrust reflex [pushing food out of the mouth] is fading, their sucking reflex has changed to allow more coordinated swallowing, they can sit with support, and they have good head and neck control).
- Tell parents that there are no nutritional advantages to introducing solid foods before the infant is developmentally ready. However, there may be disadvantages (eg, overfeeding, improper balance of nutrients) to doing so.[4]
- Instruct parents to begin one single-ingredient new food at a time and not to introduce other new foods for 3 to 5 days to observe the infant for possible allergic reactions. Iron-fortified infant rice cereal appears to be one of the solid foods least likely to cause an allergic reaction.[4] (See the Food Allergy chapter.)
- Explain to parents that infants who are at high risk for developing allergies are those with at least one first-degree relative (parent or sibling) with allergic disease. Breastfeeding exclusively for at least 4 months or using hydrolyzed formulas may prevent or delay the occurrence of atopic dermatitis, cow's milk allergy, and asthma in infancy and early childhood.[17]
- Encourage parents to gradually introduce a variety of pureed or soft meats, fruits, and vegetables after cereals. The gradual introduction of a variety of foods, flavors, and textures[18] contributes to a balanced diet and helps promote healthy eating behaviors.[4]
- Encourage parents to talk to the infant during feedings. As infants develop, they increasingly respond to social interaction.

- Discuss with parents that their oral health has an impact on their infant's oral health because parents can transmit caries-promoting bacteria to their infant. It is important for parents to visit the dentist regularly, limit foods high in sugar, and practice good oral hygiene (ie, brushing their teeth twice a day with fluoridated toothpaste, flossing once a day).[13]
- Inform parents that infant toys encourage physical activity. Playing with safe, age-appropriate toys (eg, rattles, stuffed animals, plastic toys), moving them from hand to mouth, and sucking and gumming them helps infants develop skills they will use later when they begin to feed themselves.

FOR PARENTS OF BREASTFED INFANTS

- Congratulate the mother for continuing to breastfeed!
- Explain to parents that demand for more frequent breastfeeding is usually related to the infant's growth spurt and is nature's way of increasing breast milk supply. If an increased demand continues for a few days; is not affected by increased breastfeeding; and is unrelated to illness, teething, or changes in routine, it may be a sign that the infant is ready for solid foods.
- Instruct parents to continue vitamin D supplementation and if the infant is developmentally ready, offer good sources of iron such as iron-fortified, single-grain infant cereals (eg, rice cereal) and pureed meats, especially red meats, as the first solid food. They provide ample sources of iron, zinc, and protein, nutrients especially needed by breastfed infants.[4,19,20] One ounce (30 g) of infant cereal provides an infant's daily iron requirement, particularly if the infant is fed with foods rich in vitamin C, such as fruits, which enhances iron absorption from the cereal.
- Explain to parents that exclusively breastfed infants need iron (1 mg/kg of body weight/day) beginning at age 4 months and continued until iron-rich complementary foods have been introduced to prevent iron-deficiency anemia.[5]
- Explain to parents that partially breastfed infants (who receive more than one-half of their daily feeding from breastmilk) need iron supplement (1 mg/kg of body weight/day) beginning at age 4 months and continued until iron-rich complementary foods have been introduced to prevent iron-deficiency anemia.[5]

FOR PARENTS OF FORMULA-FED INFANTS

- Tell parents that 4-month-old infants usually consume 30 to 32 oz of infant formula in 24 hours, but they may consume 26 to 36 oz.
- Inform parents that vitamin supplements are not needed if the formula is iron-fortified and the infant is consuming an adequate volume of infant formula for appropriate growth.

6 MONTHS

Health professionals should use the general information in the section Nutrition Supervision Throughout Infancy (pages 25–29), as well as the age-specific information that follows.

Interview Questions

FOR PARENTS OF ALL INFANTS

- How is feeding going? What questions or concerns do you have?
- What are you feeding your baby at this time?
- Are you feeding her any food (liquid or solid) besides breast milk or formula?
- How often do you feed your baby?
- How much does she eat or drink? About how long do feedings last?
- Have you thought about when you will begin to give your baby solids?
- How are you planning to introduce solid foods, such as cereal, fruits, vegetables, meats, and other foods?
- How does your baby let you know when he likes a certain food?
- Has she eaten any foods from the family meal? If so, which ones?
- Has your baby fed himself anything?
- Does your baby have any favorite foods?
- What types of fluids is your baby getting in a bottle or cup?
- Do you know what your baby is fed when she is away from home (eg, at child care)?

FOR PARENTS OF BREASTFED INFANTS

- How is breastfeeding going?
- In what ways is breastfeeding different now from when you were last here?
- How often are you breastfeeding your baby? For how long on each breast?
- Does it seem like your baby is breastfeeding more often or for longer periods?
- How can you tell if your baby is satisfied at the breast?

- What are your plans for continuing to breastfeed?
- Has your baby received breast milk or other fluids from a bottle or cup?
- Have you given your baby any fluids other than breast milk, such as infant formula or cow's, goat's, or soy milk?
- Is your baby receiving vitamin D supplements?
- Is your baby receiving an iron supplement and/or iron-rich foods?

FOR PARENTS OF FORMULA-FED INFANTS

- How is formula-feeding going? What formula are you using now?
- Have you tried other formulas, or are you thinking of using other formulas?
- How often does your baby feed in 24 hours, and how much does he take at a feeding? Day feedings versus night feedings?
- Do you have any concerns about the formula (eg, cost, preparation, or nutrient content)?
- What kind of water is used to prepare the formula? Does the water contain fluoride?
- How are you preparing your formula?
- Are you worried about having enough money to buy infant formula?

Screening and Assessment

- For breastfed infants, determine whether the infant is receiving vitamin D supplements, and assess the need for iron supplementation.
- Ask whether the infant has had a dental visit.
- Assess eating behaviors to determine the infant's risk for dental caries (tooth decay). (See the Oral Health chapter.)

Anticipatory Guidance

FOR PARENTS OF ALL INFANTS

- Encourage parents to feed the infant when he is hungry. An infant shows hunger by moving his head forward to reach the spoon and swiping the food toward his mouth. He can indicate that he's full or doesn't want food by leaning back and turning away.
- Instruct parents to introduce solid foods when the infant is developmentally ready (ie, when the tongue thrust reflex [pushing food out of the mouth] is fading, his sucking reflex has changed to allow more coordinated swallowing, he can sit with support, and he has good head and neck control).
- Explain to parents that infants who are at high risk for developing allergies are those with at least one first-degree relative (parent or sibling) with allergic disease. Breastfeeding exclusively for at least 4 months or using hydrolyzed formulas may prevent or delay the occurrence of atopic dermatitis, cow's milk allergy, and asthma in early childhood.[17] (See the Food Allergy chapter.)
- Instruct parents to begin one single-ingredient new food at a time and not to introduce other new foods for 3 to 5 days to observe the infant for possible allergic reactions. Iron-fortified infant rice cereal appears to be one of the solid foods least likely to cause an allergic reaction.[4] (See the Food Allergy chapter.)
- Encourage parents to then gradually introduce other pureed or soft meats, fruits, and vegetables. The gradual introduction of a variety of foods, flavors, and textures[18] contributes to a balanced diet and helps promote healthy eating behaviors.[4]
- Instruct parents to use a spoon when offering the infant a new food.
- Emphasize to parents that if the infant does not like a new food, she should not be forced to eat it. The food can be offered at a later time. It may take 10 to 15 attempts before an infant accepts a particular food.[21,22]
- Tell parents that infants do not need salt, spices, or sugar added to their food.
- Inform parents that they can offer store-bought and home-prepared baby food, but infants who can feed themselves soft foods do not need pureed foods.
- Tell parents to serve only 100% fruit juice as part of a meal or snack. Serve juice in a cup, and limit it to 4 to 6 oz per day.[9]
- Explain to parents that a high chair allows the infant to be part of the family circle at mealtime, but a safety belt should be used to secure him.
- Encourage parents to talk to the infant during feedings. As infants develop, they increasingly respond to social interaction.
- Discuss with parents that it is best for families to drink fluoridated water; for families that prefer bottled water, a brand in which fluoride is added at a concentration of approximately 0.8 to 1.0 mg/L (ppm) is recommended.[13]

- Inform parents that by age 6 months, infants become very active and benefit from playing with toys for stacking, shaking, pushing, or dropping and from playing with others. Encourage parents to include the infant in family play.

FOR PARENTS OF BREASTFED INFANTS

- Congratulate the mother for continuing to breastfeed!
- Emphasize to parents that at age 6 months, breast milk (together with solid foods) remains the best source of nutrition for infants. Encourage the mother to continue to breastfeed for the first year of the infant's life and for as long thereafter as she and the child wish to continue.
- Instruct parents to continue vitamin D supplementation and to offer good sources of iron such as iron-fortified, single-grain infant cereals (eg, rice cereal) and pureed meats, especially red meats, as the first solid foods. They provide ample sources of iron, zinc, and protein, nutrients especially needed by breastfed infants.[4,19,20] One ounce (30 g) of infant cereal provides an infant's daily iron requirement, particularly if the infant is fed with foods rich in vitamin C, such as fruits, which enhances iron absorption from the cereal.
- Explain to parents that if a breastfed infant is unable to consume sufficient iron from dietary sources after age 6 months, elemental iron (1 mg/kg/d) can be used to prevent iron-deficiency anemia.[5]
- Explain to parents that exclusively breastfed infants need iron supplement (1 mg/kg of body weight/day) until iron-rich complementary foods have been introduced to prevent iron-deficiency anemia.[5]
- Explain to parents that partially breastfed infants (who receive more than one-half of their daily feeding from breast milk) need iron supplement (1 mg/kg of body weight/day) beginning until iron-rich complementary foods have been introduced.[5]

FOR PARENTS OF FORMULA-FED INFANTS

- Instruct parents to continue to feed the infant when she shows signs of hunger, usually 5 to 6 times in 24 hours.
- Inform parents that vitamin supplements are not needed if the formula is iron-fortified and the infant is consuming an adequate volume of formula for appropriate growth.
- Explain to parents that community water fluoridation is a safe and effective way to significantly reduce the risk for dental caries (tooth decay) in infants. Infants ages 6 months and older who receive infant formula prepared with water that is severely deficient in fluoride (<0.3 ppm) may require fluoride supplementation.[13] (See the Oral Health chapter.) Encourage parents to check with their local health department for information about community fluoride levels.

9 MONTHS

Health professionals should use the general information in the section Nutrition Supervision Throughout Infancy (pages 25–29), as well as the age-specific information that follows.

Interview Questions

FOR PARENTS OF ALL INFANTS

- How has feeding been going? What questions or concerns do you have?
- Who feeds your baby?
- When does your baby have something to eat or drink? How much does she eat or drink at a time?
- Is your baby drinking less breast milk or infant formula?
- Is your baby interested in feeding herself? What is she feeding herself?
- What does your baby eat with his fingers? Has he used a cup?
- Is your baby interested in the food you eat?
- What does your baby do when she has had enough to eat?
- Do you know what your baby eats when he is away from home (eg, at child care)?

FOR PARENTS OF BREASTFED INFANTS

- What are your plans for continuing to breastfeed? How often does your baby breastfeed? How long do you feed her each time?
- How is your milk supply?
- Is your baby receiving vitamin D supplementation?
- Has your baby had infant formula or cow's, goat's, or soy milk?
- Is your baby receiving an iron supplement and/or iron rich foods?

FOR PARENTS OF FORMULA-FED INFANTS

- How is formula-feeding going? What formula are you using now?
- How often does your baby feed in 24 hours? How much does he take at a feeding? Day feedings versus night feedings?
- How are you preparing infant formula for your baby?
- What kind of water is used to prepare the formula? Does the water contain fluoride?
- Do you have any questions about weaning your baby from the bottle?
- Are you worried about having enough money to buy infant formula?

Screening and Assessment

- Recommendations for iron-deficiency anemia screening have been put forth by the American Academy of Pediatrics (AAP) and the Centers for Disease Control and Prevention (CDC). (See the Iron-Deficiency Anemia chapter.) The AAP and CDC recommend screening infants during the first year of life.[5,23] While the AAP recommends universal screening for all infants for iron deficiency and iron-deficiency anemia at about age 12 months,[5] the CDC recommends screening infants at high risk for iron-deficiency anemia or those with known risk factors for iron-deficiency anemia at ages 9 to 12 months.[23]
- Infants considered at high risk for iron-deficiency anemia include[23]
  - Infants from families with low incomes
  - Infants who are eligible for WIC
  - Infants who are migrants or recently arrived refugees
  - Infants and children who are Mexican-American[5]
- Infants who have known risk factors for iron-deficiency anemia include[23]
  - Infants born preterm or with low birth weight
  - Infants fed non–iron-fortified infant formula for more than 2 months
  - Infants fed cow's milk before age 12 months
  - Infants who are breastfed and do not receive adequate iron from supplemental foods after age 4 months[5]
- Screen the infant for lead exposure. (See Tool E: Screening for Elevated Blood Lead Levels.)
- For breastfed and partially breastfed infants, determine whether the infant is receiving vitamin D supplements, and assess the need for iron supplementation.

Anticipatory Guidance

FOR PARENTS OF ALL INFANTS

- Explain to parents that the time between the introduction of solid foods and age 9 months is a sensitive period for learning to chew.[24,25] Exposing the infant gradually to solid textures during this time may decrease the risk for feeding problems, such as rejecting certain textures, refusing to chew, or vomiting. It may take 10 to 15 attempts before an infant accepts a particular food.[21]
- Tell parents that as their infant becomes more independent in feeding herself, parents are responsible for providing a variety of nutritious foods, and the infant is responsible for deciding how much to eat.
- Explain to parents that beginning at age 6 to 9 months, infants show more interest in the food their parents eat and less interest in breastfeeding or bottle-feeding. Nevertheless, infants should receive breast milk, infant formula, or both through the first year of life.
- Instruct parents to offer soft, moist foods (eg, mashed potatoes and other soft cooked vegetables, spaghetti with sauce, rice, tuna) as the infant gradually moves from gumming to chewing foods.
- Explain that as the infant gains more control over picking up and holding food, small pieces of soft foods can be offered.
- Encourage parents to be patient and understanding as the infant tries new foods and learns to feed himself.
- Encourage parents to remove distractions so that the infant stays focused on food.

- Explain to parents that a high chair allows the infant to be part of the family circle at mealtime, but a safety belt should be used to secure her.
- Encourage parents to let the infant drink from a cup with assistance.
- Tell parents to serve only 100% fruit juice as part of a meal or snack. Serve juice in a cup, and limit it to 4 to 6 oz per day.[9]
- Tell parents to avoid feeding the infant sweetened beverages, such as sodas and fruit drinks. These beverages contain calories but few or no nutrients.
- Explain to parents that most 9-month-olds are on the same eating schedule as the family: breakfast, lunch, and dinner. Instruct parents to give the infant snacks midmorning, in the afternoon, and in the evening.
- Instruct parents to be aware of what and how much their infant is fed while the infant is away from home.
- Discuss with parents that it is best for families to drink fluoridated water; for families that prefer bottled water, a brand in which fluoride is added at a concentration of approximately 0.8 to 1.0 mg/L (ppm) is recommended.[13]
- Explain to parents that some infants are crawling by age 9 months and may begin to walk by holding onto furniture. Warn parents never to put the infant in a walker because of the risk for severe injury or death. Parents can physically support the infant as she plays and explores her newfound strength and agility.
- Explain to parents to begin feeding the child whole milk at age 1. Reduced-fat milk (2%) is recommended for children ages 1 to 2 for whom obesity is a concern or who have a family history of obesity, dyslipidemia, or cardiovascular disease.[26]

FOR PARENTS OF BREASTFED INFANTS

- Congratulate the mother for continuing to breastfeed!
- Tell parents that, at age 9 months, breast milk (along with solid foods) continues to be the infant's best source of nutrition. Encourage the mother to continue breastfeeding through the first year of the infant's life, or for as long as the mother and the child wish to continue.
- Explain to parents that partially breastfed infants (who receive more than one-half of their daily feeding from breast milk) need iron supplement (1 mg/kg of body weight/day) beginning until iron-rich complementary foods have been introduced to prevent iron-deficiency anemia.[5]

FOR PARENTS OF FORMULA-FED INFANTS

- Instruct parents to continue to feed the infant when she shows signs of hunger, usually 5 to 6 times in 24 hours.
- Inform parents that vitamin supplements are not needed if the formula is iron-fortified and the infant is consuming an adequate volume of formula for appropriate growth.
- Explain to parents that community water fluoridation is a safe and effective way to significantly reduce the risk for dental caries (tooth decay) in infants. Infants ages 6 months and older who receive infant formula prepared with water that is severely deficient in fluoride (<0.3 ppm) may require fluoride supplementation.[13] (See the Oral Health chapter.) Encourage parents to check with their local health department for information about community fluoride levels.

The desired outcomes for the infant and the role of the family outlined in Table 1 can assist health professionals in promoting optimal nutrition.

TABLE 1. DESIRED OUTCOMES FOR THE INFANT, AND THE ROLE OF THE FAMILY

	Educational/Attitudinal	Behavioral	Health
Desired Outcomes for the Infant	Has a sense of trust Bonds with parents Enjoys eating	Breastfeeds successfully Bottle-feeds successfully if not breastfeeding Consumes supplemental foods to support appropriate growth and development	Develops normal rooting, sucking, and swallowing reflexes Develops fine and gross motor skills Grows and develops at an appropriate rate Maintains good health
Role of the Family	Bonds with the infant Enjoys feeding the infant Understands the infant's nutrition needs Acquires a sense of competence in meeting the infant's needs Understands the importance of a healthy lifestyle, including healthy eating behaviors and regular physical activity, to promote short-term and long-term health	Meets the infant's nutrition needs Responds to the infant's hunger and fullness cues Holds the infant when breastfeeding or bottle-feeding, and maintains eye contact Talks to the infant during feeding Provides a pleasant feeding environment Uses nutrition programs and food resources if needed Seeks help when problems occur	Maintains good health

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Successfully Introducing Solid Foods

John Matthews is a 6-month-old infant who has been fed only breast milk. He is 27.5 inches long and weighs 19 lbs 13 oz. Both his length and weight have been between the 75th and 90th percentiles since he was 2 months old. Lately, his appetite appears to have increased. John's family does not have any history of allergies.

At the health clinic, John's mother tells Liz Roberts, the registered dietitian, that her son seems to want to breastfeed all the time, and she wonders whether it would be all right to add some solid foods to his diet. The dietitian confirmed that John has good head and neck control and can maintain a sitting position with little or no assistance. His sucking pattern has changed from the weaker, up-and-down movements of early infancy to stronger, back-and-forth movements. He is able to grasp objects that are placed within his reach, and he brings them to his mouth. He no longer exhibits the "tongue thrust" motion when a spoon or object is placed in his mouth.

John's mother is careful to offer new foods one at a time and to observe John for 3 to 5 days or more to make sure he does not have an adverse reaction.

Ms Roberts advises mixing a small amount of iron-fortified rice cereal with expressed breast milk and offering it to John on a spoon. She recommends that John's mother try feeding him the cereal when he is well rested and slightly hungry.

When John's mother first feeds him the rice cereal, he looks surprised but swallows it. He accepts a second spoonful, then turns his head away. The next day, John's mother offers him the cereal mixture again, and he eagerly eats 4 spoonfuls. She slowly increases the amount of cereal to several tablespoons.

Over the next few weeks, John's mother gradually begins to introduce pureed meats and then pureed or soft fruits and vegetables into John's diet. She is careful to offer new foods one at a time and to observe John for 3 to 5 days or more to make sure he does not have an adverse reaction. John continues to breastfeed on demand.

Frequently Asked Questions About Nutrition in Infancy

What should I feed my baby?

- Breast milk is the ideal food for babies, and breastfeeding offers many benefits to both mothers and babies. Breastfeeding helps mothers and babies form special bonds and also helps babies resist colds, ear infections, allergies, and other illnesses.
- Exclusive breastfeeding is recommended for 4 to 6 months, but breastfeeding even for just a few months or weeks is beneficial.
- If you think you may not be able to breastfeed (eg, you have conflicts with school or work, or you have a medical condition) or if you are worried about not producing enough breast milk, talk to a health professional, breastfeeding specialist, or breastfeeding support group. They can answer your questions and help you come up with solutions. Your family and friends are also sources of support.
- If you decide to feed your baby infant formula, a health professional can help you choose the right kind of formula and answer your questions about feeding and the preparation of infant formula.
- Breast milk or iron-fortified infant formula is recommended until your baby is 12 months old. Low-iron milk (eg, cow's, goat's, soy) should not be used, even in infant cereal.
- Cow's milk, goat's milk, and soy milk are not recommended until after your baby's first birthday. Indications for use of soy-based formula instead if cow's milk formula include a preference for a vegetarian diet or an infant with galactosemia or hereditary lactase deficiency (rare).

How do I know if I am feeding my baby enough breast milk?

- Your baby may show she is hungry by sucking, putting her hands in her mouth, opening and closing her mouth, or looking for the nipple. She may show she is full by falling asleep.
- Your baby will usually have 5 to 8 wet diapers and 3 or 4 stools per day by the time she is 5 to 7 days old.
- Your baby will be gaining weight. She should gain 4 to 7 oz per week and should double her birth weight by age 4 to 6 months.

What is colic? How can I prevent or manage it?

- When your baby cries without apparent reason for several hours on a regular basis, he may have colic. Colic occurs in almost 10% of babies. No one knows what causes colic, but poor parenting does not cause it. Colic usually develops between ages 2 and 6 weeks and disappears by age 3 or 4 months.
- There is no cure for colic. Here are some tips to help manage colic as you wait for your baby to outgrow it.
  - If you are breastfeeding, continue to breastfeed through the first year of life. Breastfeeding does not cause your baby to have colic.
  - Cuddle and rock your baby during crying bouts.
  - Swaddle your baby, or apply firm but gentle pressure to the stomach.
  - Darken the room or play soft music.
  - Get help so you can take time off from caring for your baby.

When and how should I introduce solid foods?

- Introduce solids foods between ages 4 and 6 months and when the tongue thrust reflex (pushing food out of the mouth) is fading, the sucking reflex has changed to allow more coordinated swallowing, your baby can sit with support, and she has good head and neck control. Offer a small amount (eg, 1 or 2 teaspoons) of one new food at a time. Wait 3 to 5 days to see how your baby tolerates the new food before introducing the next new food.
- Iron-fortified, single-grain infant cereals (eg, rice cereal) and pureed meats are good choices for first foods, especially for the breastfed infant, because they provide iron, zinc, protein, and other nutrients. These foods are least likely to cause an allergic reaction. Mixing cereal with breast milk or infant formula will make your baby more likely to accept the cereal.
- Repeated exposure to foods (10–15 tries) will make your baby more likely to accept the foods.
- Give your baby foods of varying textures (eg, pureed, blended, mashed, finely chopped, and soft lumps) as your baby developmentally progresses in eating skills from gumming to chewing foods. A gradual exposure to solid textures during the sensitive period for learning to chew (from the time solids are introduced through age 10 months) may decrease the rejection of certain textures and refusal to chew later.
- Do not add cereal to bottles or "baby food nurser kits."

When should I introduce juice, and how much?

- At age 6 months or later, introduce juice in a cup.
- Offer 100% juice in small amounts (eg, 4–6 oz per day). Too much juice (>6 oz per day) may decrease your baby's appetite for other foods and increase the risk for loose stools and diarrhea.

How can I tell if my baby is ready to feed herself?

- If your baby can pick up food and chew or mash it, she is ready to feed herself soft pieces of table food.

How can I protect my baby's teeth from tooth decay?

- Minimize exposure to natural or refined sugars in your baby's mouth by
  - Holding your baby while feeding and never propping a bottle (eg, do not use pillows or any other object to hold a bottle in your baby's mouth).
  - Breastfeeding or feeding your baby infant formula in a bottle. Give your baby juice in a cup, not in a bottle, because juice in a bottle can bathe her teeth in sugar for long periods.
  - Not allowing your baby to fall asleep with a bottle that contains milk, formula, juice, or other sweetened liquid.
  - Avoiding dipping pacifiers in any sweetened liquid, sugars, or syrups.
- Clean your baby's gums with a clean damp cloth or toothbrush and plain water after each feeding. Use a soft-bristled toothbrush with a small head designed for babies.
- Brush your baby's teeth as soon as the first tooth erupts, usually around age 6 to 10 months, twice a day.
- Serve your baby 100% fruit juice in a cup in small amounts, no more than about 4 to 6 oz per day.

When should I wean my baby from the bottle?

- As your baby begins to eat more solid foods and drink from a cup (at about age 9–10 months), you can begin to wean him gradually from a bottle.
- By age 12 to 14 months, most babies can drink from a cup.

When should I give my baby cow's milk?

- Continue to feed your baby breast milk or iron-fortified infant formula for the first year of life.
- After your baby's first birthday, you can feed her cow's milk, goat's milk, or soy milk.

Should I give my baby sweets?

- Do not give your baby sweets, such as sweetened drinks, candy, cake, or cookies, during the first year of life. Your baby needs to eat healthy (nutrient-rich) foods for growth and development.

How do I avoid feeding my baby too much?

- Breastfeed, if possible, because breastfed babies have more control over how much they eat at each feeding.
- Learn how your baby shows he is hungry, and feed him only when he is hungry. Feed your baby slowly. Do not enlarge the hole in the bottle nipple to make expressed breast milk or infant formula come out faster.
- Do not add cereal to the bottle; this may cause your baby to eat more than he needs.
- Comfort your baby by talking to him and by cuddling, rocking, and walking him—not by feeding him. Using food to comfort your baby may teach him to use food as a source of comfort as he gets older.
- Feed your baby until he is full. It takes about 20 minutes for your baby to feel full. Don't force her to finish a bottle or other foods. Stop feeding her at the earliest sign of unwillingness to eat.
- When your baby is eating solid foods, feed him nutritious foods (eg, fruits, vegetables, lean meats, whole grains with breast milk or iron-fortified infant formula), and avoid feeding him foods that provide calories without nutrients (eg, sweetened drinks, french fries, chips, candy, cake).
- Serve meals and snacks at regular times, and avoid continuous feeding or "grazing."

What can I expect my baby to do as she grows?

From birth to about age 1 month, your baby will

- Begin to develop the ability to start and stop sucking.
- Wake up and fall asleep easily.

At about age 3 to 4 months, your baby will

- Drool more.
- Put his hand in his mouth a lot.

At about age 4 to 6 months, your baby will

- Bring objects to her mouth.
- Begin to eat solid foods, such as pureed or soft meats, fruits, and vegetables, and iron-fortified infant cereals.
- Explore foods with her mouth.

At about age 7 to 9 months, your baby will

- Try to grasp foods, such as toast, crackers, and teething biscuits, with all fingers and pull them toward his palm.
- Move food from one hand to the other.

At about age 9 to 11 months, your baby will

- Reach for pieces of food and pick them up between her thumb and forefinger.
- Try to hold a cup.
- Pick up and chew soft pieces of food.

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Early Childhood

Early Childhood

CONTEXT

During early childhood, a child's world expands to include friends, schoolmates, and others in the community. The child's physical, cognitive, social, and emotional development are tightly linked. For example, nutrition affects not only children's physical health but also their emotional health. When offered developmentally appropriate food in a supportive environment, children can thrive.

Early childhood is divided into 2 stages: the toddler stage (ages 1 and 2) and the young child stage (ages 3 and 4). The toddler stage can be stressful for parents as toddlers develop a sense of independence. Toddlers may struggle with their parents over food, refusing to eat certain foods. In addition, toddlers are still developing fine motor skills, so eating is often messy. By age 3, young children usually are more competent at feeding themselves than they were as toddlers; however, they still prefer eating with their hands rather than using utensils. Both toddlers and young children can recognize internal cues of hunger and fullness and serve themselves accordingly.[1] As they get older, many young children become more interested in trying new foods, and they enjoy participating in family meals.

Practicing healthy eating behaviors during early childhood is essential for

- Promoting optimal growth, development, and health
- Preventing immediate health problems (eg, iron-deficiency anemia, undernutrition, vitamin D deficiency, overweight or obesity, dental caries [tooth decay])
- Laying the foundation for lifelong health and reducing the risk for chronic diseases (eg, cardiovascular disease, type 2 diabetes mellitus, obesity, hypertension, some forms of cancer, osteoporosis)

GROWTH AND PHYSICAL DEVELOPMENT

A child's birth weight quadruples by age 2. Between ages 2 and 5, children gain an average of 4.5 to 6.5 lb per year and grow 2.5 to 3.5 inches per year. As the growth rate declines during early childhood, a child's appetite decreases, and the amount of food consumed may become unpredictable.[2] To promote optimal growth and development, children should be offered foods at scheduled mealtimes (3 daily) and snack times (2–3 daily).

During early childhood, children predominantly use their cheeks rather than their tongues to swallow. As toddlers' eating skills develop, they progress from eating soft pieces of food to foods with more texture. By age 3 or 4, children are able to use their fingers to push food onto a spoon, pick up food with a fork, and drink from a cup. Young children do not yet have the muscle control to cut their food or eat all foods neatly. However, if they can shovel sand or pour water from a pail, they can be taught to serve themselves food from bowls and plates—an important self-help skill that allows them to self-regulate their food intake. When children are allowed to serve themselves, they tend to take less and eat what they take.[1]

Children who are bottle-fed should be weaned from the bottle and encouraged to use a cup at about age 12 to 14 months. The risk for tooth decay increases if children are allowed to suck on a bottle or sipper-type ("sippy") cup containing beverages high in sugar (eg, fruit drinks, fruit juice), milk, or formula during the day or night for prolonged periods, because these beverages can pool around their teeth.

DEVELOPMENT ISSUES

THE TODDLER: AGES 1 TO 2

Toddlers tend to be leery of new foods and may refuse to eat them. They need to look at the new foods and touch, smell, feel, and taste them many times before they accept them.[3,4] Toddlers are unpredictable. They may like certain foods one day and dislike them the next. They may eat a lot one day and very little the next. Unlike adults, they usually eat only 1 or 2 foods at a meal. Parents often become alarmed when toddlers' eating behaviors change radically or abruptly.

Toddlers' growth rates decrease during early childhood; therefore, their energy needs decrease. Despite these changes, toddlers usually consume a variety of foods if parents continue to serve developmentally appropriate healthy meals and snacks.

To encourage toddlers to establish healthy eating behaviors, parents need to provide a structured but pleasant mealtime environment and serve as role models by eating a variety of foods. Parents should include their toddler in family meals by providing a high chair or booster seat at table height and using appropriate-sized utensils and cups.

THE YOUNG CHILD: AGES 3 TO 4

Around age 3 or 4, most young children become more curious about food, although they still may be reluctant to try new foods. This reluctance can be overcome if parents talk about new foods and allow their child to prepare and perhaps grow them.

As young children grow, they become less impulsive and can follow instructions. They can stay calm when they are hungry, join in conversation during mealtimes, serve themselves from bowls and plates, and pass food to others. Young children are more comfortable eating in unfamiliar places than they were as toddlers.

Young children should be encouraged to try new foods. The goal is for children to accept a variety of healthy foods—not simply to eat what is on their plates.

HEALTHY LIFESTYLES

The most important nutrition message to impart to parents is that they need to offer their child a variety of healthy foods throughout the day, given in 3 small meals and 2 to 3 snacks. After age 2, children should gradually reduce the number of calories they consume from high-fat foods, so that by age 5 they are eating between 25% and 35% of their total daily calories as fat.[5] As children begin to consume fewer calories from fat, they need to eat more whole-grain products; fruits; vegetables; low-fat milk products and other calcium-rich foods; and beans, lean meat, poultry, fish (especially those that contain special fats such as salmon, trout, and albacore tuna),[6] and other protein-rich foods.

Early childhood is a key time for promoting the development of motor skills and good habits for physical activity that will last a lifetime. Most children are active but, because of space or safety concerns, they may not have the opportunity to master large motor skills, learn how their body moves in space, or play and explore. Parents need to plan activities so that children can master control of their large muscles but still have time to just play.

Physical activities (eg, running, jumping, climbing, throwing, catching) should be encouraged. Simple games such as Simon Says, chase, and tag are appropriate during early childhood. Dancing can help children learn to move in space (eg, sideways, backwards). Because most children need to develop their large and small motor skills, they are not ready for organized, competitive sports, which require visual acuity, control, cooperation, and balance. Being physically active helps ensure that children maintain a healthy weight.

BUILDING PARTNERSHIPS

Early childhood provides an opportunity for health professionals, families, and communities to teach children about healthy eating behaviors, encourage positive attitudes toward food and eating, and promote regular physical activity.

Health professionals can give parents the opportunity to discuss nutrition issues and concerns about their children and can identify and contact community resources to help parents feed their children.

Many children spend time with child care providers or participate in Head Start or other preschool programs, which provide opportunities for promoting healthy eating behaviors. Children in community programs can be introduced to new foods and may try them more readily if their peers seem to be enjoying them.

Children need a variety of healthy foods served in a pleasant environment. Nutrition education should be part of the education curriculum, and child care facilities should serve a variety of healthy foods that children learn about in the program. Federally funded food assistance programs help provide children with a substantial part of their daily nutrient requirements. (See Tool K: Federal Nutrition Assistance Programs.) Food shelves and pantries, community groups, and faith-based organizations can also provide food.

Communities need to provide physical activity programs (eg, at child care facilities, recreation centers) and safe places for children to play.

COMMON NUTRITION CONCERNS

Based on data from the National Health and Nutrition Examination Survey (1976–1980 and 2003–2006), obesity prevalence has risen from 5% to 12.4% among children ages 2 to 5.[7] The consequences of this epidemic are not simply cosmetic. Children who are obese often remain obese into adulthood, and higher degrees of excess weight are associated with increasing risk of persistent obesity.[8] Obesity is associated with many chronic health conditions, including diabetes mellitus, hypertension, dyslipidemia, and cardiovascular disease.[9] (See the Obesity chapter.)

Iron deficiency and iron-deficiency anemia are common in children, especially children from families with low incomes. (See the Iron-Deficiency Anemia chapter.) Iron-deficiency anemia may have adverse effects on growth and development. The prevalence of iron-deficiency anemia can be reduced by doing the following[10,11]:

- Waiting until children are 12 months old before feeding them cow's milk
- Offering children no more than 16 oz of cow's milk daily
- Encouraging consumption of iron-rich foods (eg, meat, fish, poultry) and foods that contain vitamin C (eg, fruits, vegetables), which enhances iron absorption

Children with special health care needs may have nutrition concerns, including poor growth, poor eating skills, inadequate or excessive food intake, developmental delays, elimination problems, and metabolic disorders. These children may need specialized care from a dietitian; they may also need referral to early intervention programs in their communities. (See the Children and Adolescents With Special Health Care Needs chapter.)

Nutrition Supervision

A child's nutrition status should be evaluated during nutrition supervision visits or as part of health supervision visits. (For more information on health supervision, see *Bright Futures: Guidelines for Health Supervision of Infants, Children, and Adolescents,* 3rd Edition, listed under Suggested Reading in this chapter.) It is important to remember that nutrition supervision, which includes asking interview questions, conducting screening and assessment, and providing anticipatory guidance, should be used as appropriate and will vary from visit to visit and from child to child.

Health professionals begin nutrition supervision by selectively asking interview questions about the child's nutrition status to invite discussion and build partnerships. Use of the questions may vary from visit to visit and from family to family. Questions can be modified to match the health professional's communication style. Gathering information can also be accomplished by reviewing a questionnaire filled out by parents before the visit. (See Tool B: Nutrition Questionnaire for Children Ages 1 to 10) Additionally, to meet the challenge of providing nutrition supervision to diverse populations, health professionals need to appreciate the variety of cultural traditions related to food and the wide variation in food practices within and among cultural groups. (See the Cultural Awareness in Nutrition Services chapter.) Asking interview questions provides a useful starting point for identifying a child's nutrition concerns.

These methods provide a useful starting point, followed by screening and assessment to identify a child's nutrition concerns. The accompanying anticipatory guidance should be geared to address the family's questions and nutrition concerns for that particular child and family. Health professionals provide anticipatory guidance to parents to offer information on the child's nutrition status, to make parents aware of what to expect as the child enters the next developmental period, and to foster the promotion of healthy eating behaviors. (See Tool G: Strategies for Health Professionals to Promote Healthy Eating Behaviors.)

Nutrition supervision information that pertains to the entire early childhood developmental period (Nutrition Supervision Throughout Early Childhood) is provided first, followed by information for age-specific visits. Interview questions, screening and assessment, and anticipatory guidance should be used as appropriate and will vary from visit to visit and from child to child.

NUTRITION SUPERVISION THROUGHOUT EARLY CHILDHOOD

Interview Questions

- What concerns do you have about your child's eating behaviors or growth?
- How does your child let you know when she is hungry and when she is full?
- What concerns do you have about your child's weight?
- Describe what your child does during mealtimes. What do you do?
- What do you do if your child doesn't like a particular food?
- Do you enjoy sharing meals and snacks with her?
- Do you have appropriate equipment for feeding your child (for example, cups, eating utensils, a highchair, a booster seat)?
- Do you have any concerns about the food served to her when she is away from home?
- What is the source of your drinking and cooking water? Do you use bottled or processed water?
- Are you concerned about having enough money to buy food?

Screening and Assessment

Growth and Development

- Measure the child's length or height and weight, and plot these on a standard growth chart. Deviation from the expected growth pattern (eg, a major change in growth percentiles on the chart) should be evaluated. This may be normal or may indicate a nutrition problem (eg, difficulties with eating).

- Length or height and weight measurements can be used to indicate nutrition and growth status. Changes in weight reflect a child's short-term nutrient intake and serve as general indicators of nutrition status and overall health. Low height-for-age reflects long-term, cumulative nutrition or health problems.
- Body mass index (BMI) is used as a screening tool to determine nutrition status and overall health. Calculate the child's BMI by dividing weight by the square of height (kg/m^2) or by referring to a BMI chart. Plot the child's BMI on a BMI-for-age and sex growth chart to determine the child's BMI-for-age percentile.
- Evaluate the appearance of the child's skin, hair, teeth, gums, tongue, and eyes.

Iron-Deficiency Anemia

- Recommendations for iron-deficiency anemia screening have been put forth by the American Academy of Pediatrics (AAP) and the Centers for Disease Control and Prevention (CDC). (See the Iron-Deficiency Anemia chapter.)

Children 12 to 18 Months

- The AAP recommends universal screening for all children for iron deficiency and iron-deficiency anemia at about age 12 months and about age 18 months.[10]
- The CDC recommends screening children at high risk for iron-deficiency anemia or those with known risk factors for iron-deficiency anemia at ages 9 to 12 months and again 6 months later (ages 15–18 months).[11]
  - Children considered at high risk for iron-deficiency anemia include[11]
    - Children from families with low incomes
    - Children who are eligible for the Special Supplemental Nutrition Program for Women, Infants and Children (WIC)
    - Children who are migrants or recently arrived refugees
    - Children who are Mexican American[10]
  - Children who have known risk factors for iron-deficiency anemia include[11]
    - Children born preterm or with low birth weight
    - Children fed non–iron-fortified infant formula for more than 2 months
    - Children fed cow's milk before age 12 months
    - Children who are breastfed and do not receive adequate iron from supplemental foods after age 4 months
    - Children who consume more than 24 oz of cow's milk per day
    - Children with special health care needs who use medications that interfere with iron absorption (eg, antacids, calcium, phosphorus, magnesium), or those with chronic infection, inflammatory disorders, restricted diets, or extensive blood loss from a wound, an accident, or surgery

Children Ages 2 to 5

- The AAP recommends screening children for iron-deficiency anemia annually, if any of the following risk factors are present[3]:
  - Children with special health care needs
  - Children who consume a diet low in iron
  - Children who consume a vegetarian diet
  - Children from low socioeconomic status
  - Children in families with limited access to food
- The CDC recommends screening of children annually, if any of the following risk factors are present[11]:
  - Children who consume a diet low in iron
  - Children with limited access to food because of poverty or neglect
  - Children with special health care needs
  - Children from families with low incomes
  - Children who are eligible for WIC
  - Children who are migrants or recently arrived refugees

Oral Health

- Ask whether the child has regular dental visits.
- Assess eating behaviors (eg, frequency of eating foods and beverages high in sugar) to determine the child's risk for dental caries (tooth decay). (See the Oral Health chapter.)

Physical Activity

- Ask how much physical activity the child is doing on a weekly basis.
- Screen for the amount of time the child spends watching television and on other media activities, such as computer or video games. Ask whether the child watches television during mealtimes.

Anticipatory Guidance

Anticipatory guidance should address the child's and parents' nutrition concerns. In addition, health professionals should offer information on the child's nutrition status; make the child and parents aware of what to expect as the child enters the next developmental period; and promote a positive attitude toward eating behaviors, food choices, and physical activity. (For additional information, see Tool F: Stages of Change—A Model for Nutrition Counseling and Tool G: Strategies for Health Professionals to Promote Healthy Eating Behaviors.)

Parent-Child Feeding Relationship

- Inform parents that they are responsible for what, when, and where their child eats. To ensure that their child's nutrition needs are met, parents need to
  - Purchase and prepare nutritious food.
  - Schedule mealtimes and snack times, offering developmentally appropriate and healthy foods.
  - Make mealtimes and snack times pleasant.
  - Make sure their child develops eating and self-serving skills (eg, progresses from using his hands for eating to using utensils).[12]
  - Help their child learn to self-regulate food intake by responding to internal cues of hunger and fullness.
- Tell parents that children are responsible for deciding whether to eat and how much.[12]

Eating Behaviors

- Emphasize to parents that children need healthy meals and snacks at scheduled times throughout the day to help them achieve nutritional balance.[13]
- Tell parents that children are unpredictable in the amounts and types of foods they eat, from meal to meal and from day to day. Reassure parents that children usually eat enough food to meet their nutrition needs.
- Instruct parents to modify foods to make them easier for their child to eat.
- Tell parents to provide healthy snacks rich in complex carbohydrates and only moderate amounts of sweets and high-calorie, low-nutrient snacks. Some examples include whole-wheat crackers with string cheese, plain yogurt with sliced peaches, or milk and an oatmeal cookie.
- Encourage parents to offer their child whole-grain breads and cereals.
- Explain to parents that from ages 2 to 5, children make the transition from the higher fat intake infants need to the lower fat intake recommended for the rest of the population. Inform parents that children's fat intake should gradually be reduced to no more than 25% to 35% of their daily calories by age 5. Tell parents that children ages 2 to 3 need the same number of servings as children ages 4 to 6, but younger children may need smaller portions—about two-thirds of a serving for each serving an older child would eat.[14]
- Instruct parents to serve children ages 1 to 2 whole milk. After age 2, children should gradually increase the proportion of low-fat foods in their diets. For children older than age 2, low-fat (1%) or fat-free (skim) milk is recommended.[14] Reduced-fat milk (2%) is recommended for children ages 1 to 2 for whom obesity is a concern or who have a family history of obesity, dyslipidemia, or cardiovascular disease.[15]
- Explain to parents that as children begin to consume fewer calories from fat, they need to eat more grain products, especially whole grains; fruits; vegetables; low-fat milk and milk products; and beans, lean meat, poultry, fish, and other protein-rich foods.
- Tell parents to offer 2 servings of milk (two 8-oz cups) per day to children ages 2 to 6.[14] Excessive milk intake can reduce the child's appetite for other foods.
- Tell parents that to prevent rickets and vitamin D deficiency, children who do not obtain 400 IU/day of vitamin D through vitamin D–fortified milk (100 IU per 8-oz serving) and vitamin D–fortified foods (eg, fortified cereals, eggs [yolk]) should receive a vitamin D supplement of 400 IU/day.[16]
- Explain to parents that by the time children are 4 years old, they can eat serving sizes similar to those eaten by older family members (eg, ½ cup of fruits or vegetables; ¾ cup of 100% fruit juice; 1 slice of whole-grain bread; 2 to 3 oz of cooked lean meat, poultry, or fish).
- Encourage parents to wean their child from the bottle by age 12 to 14 months.
- Instruct parents to serve 100% fruit juice in a cup instead of a bottle and to limit the child's consumption of juice to 4 to 6 oz per day.

- Explain to parents that children who drink unlimited amounts of 100% fruit juices or sweetened beverages (eg, fruit drinks, soft drinks) are at increased risk for dental caries (tooth decay) and minor infections and may experience loose stools and diarrhea.
- Emphasize to parents that children who consume unlimited amounts of foods (eg, candy, cookies) and beverages (eg, fruit drinks, soft drinks) high in sugar are likely to fill up on these foods rather than eat healthy foods.
- Encourage parents to make sure their child drinks plenty of water throughout the day.

Mealtimes

- Encourage parents to offer children healthy food choices at meals served at approximately the same time each day. Mealtimes at home, preschool, child care, and other places can be used to teach children to make healthy food choices.
- Explain to parents that meals and snacks are important social times for children. Parents should turn off the television and make mealtimes and snack times pleasant.
- Emphasize to parents that children eat better when an adult is nearby, particularly when the adult shares the meal or snack with them.
- Tell parents that once a child can shovel sand or pour water from a pail, parents can teach the child to serve herself at the table.
- Encourage parents to be patient and understanding if their child makes a mess while she learns to feed or serve herself.
- Tell parents that they can encourage their child to eat new foods by offering small portions—perhaps 1 or 2 tablespoons—and allowing the child to serve herself the food.
- Encourage parents to be positive role models when they offer new foods to their child by eating these foods themselves.
- Instruct parents to offer their child a variety of healthy foods, and allow the child to choose which ones to eat.
- Instruct parents to modify foods to make them easier and safer for their child to eat.
- Caution parents not to pressure their child to eat certain foods or to eat more than she wants. Parents can help their child respond to internal hunger and fullness cues.
- Tell parents not to use foods to reward, bribe, or punish their child or to calm, comfort, or entertain her.
- Emphasize to parents that children benefit when parents praise them for their accomplishments and are patient and understanding.
- Encourage parents to offer dessert as part of the meal. A small serving of certain desserts (eg, custard, pudding, fruit, yogurt) makes a healthy contribution to the meal.
- Explain to parents that because young children often eat small amounts of food at one time, they should be offered nutritious foods (eg, whole-grain crackers, milk and milk products, fruits, vegetables, meat or poultry) as snacks.

Food Safety

- Inform parents that children are at high risk for many foodborne illnesses because their immune and gastrointestinal systems are not fully developed. To reduce the risk for foodborne illnesses, parents need to follow food safety practices. (See Tool H: Basics for Handling Food Safely.)
- Tell parents to use a high chair or booster seat when feeding their child.
- Provide parents with instructions, as needed, about special techniques for positioning, special equipment, or modified utensils for feeding their child with special health care needs.
- Instruct parents to take the following precautions to prevent their child from choking[17]:
  - Stay with children while they are eating.
  - Have children sit while eating. Eating while walking or running may cause choking.
  - Do not allow children to eat in the car. If the parent is driving, he or she will not be able to help if choking occurs.
  - Keep mealtimes and snack times calm. Overexcitement while eating may cause children to choke.
  - For toddlers, foods that may cause choking should be avoided (eg, hard candy, mini-marshmallows, popcorn, pretzels, chips, spoonfuls of peanut butter, nuts, seeds, large chunks of meat, hot dogs, raw carrots, raisins and other dried fruits, whole grapes).[13]

- Explain to parents that children ages 3 to 5 may eat these foods if they are modified to make them safer (eg, cutting hot dogs in quarters lengthwise and then into small pieces, cutting whole grapes in half lengthwise, chopping nuts finely, chopping raw carrots finely or into thin strips, spreading peanut butter thinly on crackers or bread).[17]
- Caution parents not to let their child eat in the car. If the parent is driving, he or she will not be able to help the child.

Teaching Children About Food

- Encourage parents to offer their child a wide variety of healthy foods.
- Tell parents that they can help their child learn about foods from other cultures by offering foods from other cultures.
- Encourage parents to teach their child how foods are grown (eg, by planting a vegetable garden) and where foods come from (eg, by visiting a dairy farm).
- Suggest that parents read books about foods to their child and talk about what they ate when they were children.
- Encourage parents to involve the child in food shopping and preparation.

Oral Health

- Instruct parents with children ages 1 to 2 to brush their child's teeth with a small, soft toothbrush and a smear of fluoridated toothpaste twice a day (after breakfast and before bed).
- Instruct parents with children ages 2 and older to brush their child's teeth using a small, soft toothbrush and a pea-sized amount of toothpaste twice a day (after breakfast and before bed).
- Explain to parents that toothbrushing requires good fine motor control and that young children cannot clean their teeth without parental help. After children acquire fine motor skills (eg, the ability to tie their shoelaces), typically by age 7 or 8, they can clean their teeth effectively but should be supervised by a parent.
- Tell parents that limiting their child's consumption of foods (eg, candy, cookies) and beverages (eg, fruit drinks, soft drinks) high in sugar can help prevent dental caries (tooth decay).
- Explain to parents that drinking fluoridated water is a safe and effective way to significantly reduce the risk for tooth decay in children. (See the Oral Health chapter.) For families that prefer bottled water, a brand in which fluoride is added at a concentration of approximately 0.8 to 1.0 mg/L (ppm) is recommended.[18]

Physical Activity

- Tell parents that children's bodies need bursts of activity followed by short periods of rest.
- Explain to parents that children need to engage in both structured and free play so that their large motor skills and spatial awareness develop in a progressive, sequential way.[19] Structured play occurs when the child is involved in an activity that serves a developmental physical purpose (eg, following the leader to master hopping), whereas in free play, the child can move in any way he likes.
- Encourage parents to be good role models by playing with their child and being physically active themselves. Parents' involvement and enthusiasm have a positive impact on their child's play experiences.
- Suggest that parents plan activities each week to encourage all family members to be physically active.
- Encourage parents to let their child decide which physical activities the family will do together but to match the child's abilities to the activity (eg, walking, hiking, skating, swimming, playing tag).
- Point out to parents that community projects (eg, neighborhood cleanup days, community gardens, food drives) provide opportunities for the entire family to be physically active together.
- Discourage television viewing for children younger than age 2, and encourage more interactive activities that promote proper brain development, such as talking, playing, singing, and reading together.
- For children ages 2 and older, long periods of sedentary activity, such as watching television or playing computer or video games, should be discouraged. Limit the child's total entertainment media time (eg, watching television, playing computer or video games) to no more than 1 to 2 hours of quality programming a day.[20]

NUTRITION SUPERVISION BY VISIT

1 YEAR

Health professionals should use the general information in the section Nutrition Supervision Throughout Early Childhood (pages 56–60) as well as the age-specific information that follows.

Interview Questions

- What is your child's feeding routine?
- Are you breastfeeding your child? Are you giving him infant formula or milk in a bottle or cup?
- What type of infant formula or milk do you feed him?
- How much fruit juice or how many sweetened drinks (for example, fruit drinks, soft drinks) does your child drink? Is the juice 100% fruit juice? When does he drink them?
- Does your child drink from a cup? Does he drink from a bottle now and then? If so, what are your plans for weaning him from the bottle?
- What textures of food does your child eat? Does he eat pieces of soft food?
- Describe what your child does during mealtimes. Does he eat with the family?
- What concerns do you have about your child's weight?

Screening and Assessment

- Screen the child for lead exposure. (See Tool E: Screening for Elevated Blood Lead Levels.)
- Evaluate the child's progress in developing eating skills. Make sure the child
  - Can bite off small pieces of food.
  - Can put food in the mouth.
  - Has an adequate gag reflex.
  - Can retain food in the mouth (ie, doesn't immediately swallow).
  - Can chew food in an up-and-down or rotary motion.
  - Can use a "pincer grasp" to pick up small pieces of food.
  - Can drink from a cup.
- Evaluate the child's interest in active play. Children should be actively playing with a parent daily. Bouncing, crawling, and climbing are age-appropriate activities.

Anticipatory Guidance

- Encourage parents to give their child opportunities to develop her eating skills (including chewing and swallowing) by offering a variety of foods and to feed herself at the family table.
- Instruct parents to serve their child beverages in a cup. Children may need help drinking from a cup; however, they may be able to use a sipper-type ("sippy") cup by themselves.
- Encourage parents to serve their child a variety of soft foods.
- Explain to parents that children are unpredictable in the amount and types of foods they eat from meal to meal and from day to day. Reassure parents that children usually eat enough food to meet their nutrition needs.
- Instruct parents to offer their child food every 2 to 3 hours, because children's capacity to eat at any one time is limited. Begin to schedule meals and snacks.
- Explain to parents that children will test limits by asking for certain foods and perhaps by throwing tantrums when refused.
- Reassure parents that they can impose limits on their child's unacceptable mealtime behaviors without controlling the amount or types of foods she eats.
- Explain to parents about the effects of television and media viewing. Encourage them to turn off the television during mealtimes. Discourage television viewing for children younger than age 2, and encourage more interactive activities that will promote proper brain development, such as talking, playing, singing, and reading together.[20]

15 MONTHS

Health professionals should use the general information in the section Nutrition Supervision Throughout Early Childhood (pages 56–60), as well as the age-specific information that follows.

Interview Questions

- Are you breastfeeding your child? Are you giving him bottles? Milk in a cup? What kind of milk does he drink? How much?
- How much fruit juice or how many sweetened drinks (for example, fruit drinks, soft drinks) does your child drink? Is the juice 100% fruit juice? When does he drink them?

- Which foods does your child like to eat? Are there any foods he doesn't like?
- Describe your child's mealtimes. Does he eat with the family?
- Does he ask for food between meals and snacks? If so, how do you handle this?
- Does your child throw tantrums over food? If so, how do you handle them?
- What kinds of physical activities does your child enjoy?
- What concerns do you have about your child's weight?

Screening and Assessment

- Evaluate the child's progress in developing large motor skills. Children should be actively playing with a parent daily.

Anticipatory Guidance

- Instruct parents to offer their child food every 2 to 3 hours, because children's capacity to eat at any one time is limited.
- Explain to parents that by age 15 to 18 months, the child should be able to eat healthy foods that the family is eating at mealtimes, as long as parents are offering age-appropriate foods (eg, foods cut into small pieces). Continue to monitor the size of foods offered. Chewing and swallowing functions are not completely developed until about age 8.
- Instruct parents to use spoons, cups, and dishes with steep sides (eg, bowls) to make eating easier for the child.
- Reassure parents that children will become increasingly skilled at eating a variety of foods.
- Emphasize to parents that children benefit from a relaxed atmosphere during meals and snacks. Children should not be rushed, because trying new foods takes time.
- Explain to parents about the effects of television and media viewing. Encourage them to turn off the television during mealtimes. Discourage television viewing for children younger than age 2, and encourage more interactive activities that will promote proper brain development, such as talking, playing, singing, and reading together.[20]

18 MONTHS

Health professionals should use the general information in the section Nutrition Supervision Throughout Early Childhood (pages 56–60), as well as the age-specific information that follows.

Interview Questions

- Are you breastfeeding your child? Are you giving him bottles? Milk in a cup? What kind of milk does he drink? How much?
- How much fruit juice or how many sweetened drinks (for example, fruit drinks, soft drinks) does your child drink? Is the juice 100% fruit juice? When does he drink them?
- Which foods does your child like to eat? Are there any foods he doesn't like?
- Describe your child's mealtimes. Does he eat meals with the family?
- Does he ask for food between meals and snacks? If so, how do you handle this?
- Does your child throw tantrums over food? If so, how do you handle them?
- What concerns do you have about your child's weight?

Screening and Assessment

- Screen the child for lead exposure. (See Tool E: Screening for Elevated Blood Lead Levels.)
- Evaluate the child's progress in developing large motor skills. Children should be actively playing with a parent daily.

Anticipatory Guidance

- Instruct parents to offer their child food every 2 to 3 hours, because children's capacity to eat at any one time is limited.
- Encourage parents to give their child opportunities to develop her eating skills (including chewing and swallowing) by offering a variety of foods and to feed herself at the family table.
- Explain to parents that children need forks and spoons that are designed for them (ie, those that are smaller and easier to use).
- Explain to parents about the effects of television and media viewing. Encourage them to turn off the television during mealtimes. Discourage television viewing for children younger than age 2, and encourage more interactive activities that will promote proper brain development, such as talking, playing, singing, and reading together.[20]

2 YEARS

Health professionals should use the general information in the section Nutrition Supervision Throughout Early Childhood (pages 56–60), as well as the age-specific information that follows.

Interview Questions

- Has your child been weaned from the bottle?
- What kind of milk does she drink? How much?
- How much fruit juice or how many sweetened drinks (for example, fruit drinks, soft drinks) does your child drink? Is the juice 100% fruit juice? When does she drink them?
- Which foods does your child like to eat? Are there any foods she doesn't like?
- Describe your child's mealtimes. How often does she eat with the family?
- Can your child shovel sand into a pail or pour water from a bucket? If she can, let her try to serve foods from a bowl or platter onto her plate.
- Does she eat the same foods as the rest of the family?
- What do you do when your child does not want to eat or only wants to eat a particular food?
- What concerns do you have about your child's weight?

Screening and Assessment

- Screen the child for lead exposure. (See Tool E: Screening for Elevated Blood Lead Levels.)
- Assess the child's risk for familial hyperlipidemia. (See the Hyperlipidemia chapter.)
- Evaluate the child's progress in developing large motor skills. Children should be actively playing with a parent daily.

Anticipatory Guidance

- Encourage parents to give their child opportunities to develop her eating skills (including chewing and swallowing) by offering a variety of foods.
- Encourage parents to allow their child to self-regulate food intake by serving himself from bowls and plates. This is messy at first, but with practice, this self-help skill can be mastered.
- Reassure parents that food jags in children (when children only want to eat a particular food) are common. Smaller servings of the favored food can be offered along with other foods to ensure that the child eats a variety of healthy foods.
- Explain to parents about the effects of television and media viewing. Encourage them to turn off the television during mealtimes. Limit the child's total entertainment media time (eg, watching television, playing computer or video games) to no more than 1 to 2 hours of quality programming a day. Encourage more interactive activities that will promote proper brain development, such as talking, playing, singing, and reading together.[20]

3 TO 4 YEARS

Health professionals should use the general information in the section Nutrition Supervision Throughout Early Childhood (pages 58–62), as well as the age-specific information that follows.

Interview Questions

- What kind of milk does your child drink? How much?
- How much fruit juice or how many sweetened drinks (for example, fruit drinks, soft drinks) does your child drink? Is the juice 100% fruit juice? When does he drink them?
- Which foods does your child like to eat? Are there any foods he doesn't like?
- What concerns do you have about your child's weight?
- Describe what your child does during mealtimes. Does he serve himself foods? Does he eat meals with the family?
- How often do you serve snacks? What types of foods do you serve?

Screening and Assessment

- Screen the child for lead exposure. (See Tool E: Screening for Elevated Blood Lead Levels.)
- Obtain the child's blood pressure. (See the Hypertension chapter.)
- Assess the child's risk for familial hyperlipidemia. (See the Hyperlipidemia chapter.)

- Evaluate the child's progress in developing large motor skills. Children should be actively playing with a parent daily. By this age, many children can master running, marching, and galloping. Adults can direct children in ways to move their bodies around and through objects and in how to improve large and small muscle movements.

Anticipatory Guidance

- Explain that children become aware of new foods by seeing family members and friends trying, eating, and enjoying them.
- Suggest to parents that sharing stories, drawing pictures, and singing songs related to foods help children become familiar with the foods. Children enjoy learning about new foods by growing, preparing, and talking about them.
- Tell parents that they need to guide their child to improve her fitness levels (stability, agility, endurance, and coordination).
- Explain to parents about the effects of television and media viewing. Encourage them to turn off the television during mealtimes. Limit the child's total entertainment media time (eg, watching television, playing computer or video games) to no more than 1 to 2 hours of quality programming a day. Encourage more interactive activities that will promote proper brain development, such as talking, playing, singing, and reading together.[20]

The desired outcomes for the child and the role of the family can assist health professionals in promoting optimal nutrition.

TABLE 1. DESIRED OUTCOMES FOR THE CHILD, AND THE ROLE OF THE FAMILY

	Educational and Attitudinal	Behavioral	Health
Desired Outcomes for the Child	Tries new foods Enjoys a variety of healthy foods Enjoys being active	Gradually increases variety of foods eaten Eats healthy foods Participates in active play Masters increasingly complex large and small motor skills	Improves motor skills, coordination, agility, stability, endurance, and muscle tone Grows and develops at an appropriate rate Maintains good health
	Educational and Attitudinal	**Behavioral**	**Health**
Role of the Family	Understands that each child's growth and development are unique Has a positive attitude toward food Understands the nutrition needs of the growing child and the importance of scheduled healthy meals and snacks Encourages the child to try a variety of healthy foods Encourages the child to recognize and listen to internal cues of hunger and fullness Understands the importance of modifying foods for the child to make them easier and safer to eat Understands the importance of a healthy lifestyle, including eating healthy foods and being physically activity	Offers developmentally appropriate foods Schedules healthy meals and snacks Offers a variety of foods Encourages child to serve herself foods from common bowls and platters Eats meals together regularly to ensure optimal nutrition and to facilitate family communication Provides positive role models by eating healthy foods and being physically activity Uses nutrition programs and food resources if needed Provides safe opportunities for structured and active playtimes	Maintains good health

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Reducing Distractions During Mealtime

Tyler Mikkelsen, a 22-month-old, is in a home child care facility 5 days a week while his parents work. Like many other children his age, Tyler is apprehensive about trying new foods. However, he has a good appetite, and his parents have been successful in getting him to try 1 or 2 bites of a new food by modeling their own willingness to eat that food.

Tyler's parents are thus surprised when Tyler's child care provider, Fran Eisenberg, asks to speak with them about Tyler's eating. Ms Eisenberg says that Tyler will not sit down at the table long enough to eat his meal and that Tyler refuses to try new foods and sometimes refuses to eat anything at all. Tyler's parents have not noticed any changes in his eating behaviors at home. They call Sandy Hill, a dietitian, for guidance.

Ms Hill suggests that Tyler's parents visit Ms Eisenberg's home when she feeds the children. She says that the mealtime environment at child care may be very different from the environment at home, which may be affecting Tyler's appetite and interest in eating. During their visit, Tyler's parents find that Ms Eisenberg does not sit down to eat meals with the children. Ms Eisenberg turns on the television in the kitchen so the children can watch cartoons while they eat. Tyler's parents notice that Tyler is too busy watching the cartoons to pay attention to his food.

Ms Eisenberg tells Tyler's parents that as a result of the changes, Tyler and the other children in her care are eating better and enjoying mealtimes together.

Tyler's parents meet with Ms Eisenberg to discuss the mealtime environment. They tell her that they always eat at the table with Tyler to help him eat and to encourage him to try each food on his plate. They do not turn on the television during mealtimes because it distracts Tyler. Tyler's parents suggest that Ms Eisenberg join the children at mealtime to provide a family-like atmosphere. They also suggest that the television be turned off.

Ms Eisenberg agrees to try the changes to see whether Tyler's eating behaviors improve. Two weeks later, she tells Tyler's parents that as a result of the changes, Tyler and the other children in her care are eating better and enjoying mealtimes together.

Frequently Asked Questions About Nutrition in Early Childhood

How can I teach my child healthy eating behaviors?

- Eat meals together as a family.
- Help your child learn to recognize internal hunger and fullness cues. When children are hungry, they may be irritable or tired or have difficulty focusing on a task. When they are full, they will begin eating more slowly or stop eating. Less subtle but equally important cues are ones that demand your attention, such as throwing food or utensils and playing with food.
- Allow your child to serve herself from bowls and platters, once she is able to (if children can shovel sand or pour water from a pail, they can be taught to serve themselves food from bowls and plates). This is an important self-help skill that also helps to regulate food intake.
- Offer a variety of healthy foods, and encourage your child to try different ones.
- Let your child help with food shopping and preparation.
- Do not use food to reward, bribe, or punish your child.
- Be a positive role model—practice healthy eating behaviors, and engage in regular physical activity.

How can I make mealtimes enjoyable?

- Be patient and understanding when your child makes a mess while she learns to feed herself—this is normal.
- Offer healthy foods for meals and snacks at scheduled times, but allow for flexibility.
- Use your child's favorite plate, bowl, cup, and eating utensils.
- Create a relaxed setting for meals (eg, turn off the television).
- Talk with your child at mealtimes.

My 2-year-old's appetite has changed. Should I be worried?

- Children grow more slowly from ages 1 to 5 than during the first 12 months of life. Infants usually have bigger appetites than young children do.
- Children's appetites change a lot from day to day and even from meal to meal. If your child is energetic and growing, he is probably eating enough.

What should my child eat?

- At mealtimes, offer what the rest of your family is eating (eg, whole-grain breads and cereals, pasta, or rice; fruits and vegetables; cheese or yogurt; and cooked lean meat, poultry, fish, or eggs).
- Children younger than age 2 usually eat small portions. Offer small portions (eg, 1 or 2 tablespoons), and let your child ask for more if she is still hungry.
- Offer your child food every 2 to 3 hours for a meal or snack.

What can I do about my picky eater?

- Look at your child's eating over time rather than at each meal. If your child is energetic and growing, he is probably eating enough.
- Offer a variety of healthy foods, and encourage your child to try different ones.
- Continue to serve a food even if your child has rejected it.
- Let your child participate in food shopping and preparation.
- Do not use food to reward, bribe, or punish your child.

My child sometimes dawdles during meals. What can I do?

- It is normal for children to lose interest in an activity, including eating, after a short time. They are also easily distracted. Try to reduce distractions (eg, turn off the television) during meals and snacks.
- Routines are important to children. Schedule meals and snacks.

My child wants to eat only peanut butter sandwiches. What should I do?

- Food jags (when children want to eat only a particular food) are common in young children.
- Offer smaller servings of the favored food, along with other foods, to ensure that your child eats a variety of foods.
- Jags rarely last long enough to be harmful. If your child is energetic and growing, he is probably eating enough.

How can I get my child to try new foods?

- Offer small portions of new foods—perhaps 1 or 2 tablespoons—and let your child ask for more.
- Encourage your child to try a new food, but don't force her to eat it. Continue to serve a food even if your child has rejected it. It may take several times before she accepts the food.
- Serve your child's favorite foods along with new foods. She may be more willing to try new foods if her favorites are on her plate.
- Be a positive role model—eat new foods yourself.
- Introduce a new food in a neutral manner. Talk about the food's color, shape, aroma, and texture, but don't talk about whether it tastes good.
- Make trying new foods appealing by involving your child in shopping and preparing the food.

What should my child drink?

- Your child should drink about 2 cups (16 oz) of milk per day. Drinking more than this can reduce your child's appetite for other healthy foods.
- Until age 2, serve your child whole milk. Your child needs the extra fat in whole milk for growth and development.
- For children older than age 2, low-fat (1%) or fat-free (skim) milk is recommended.
- Offer 100% fruit juice in small amounts, about 4 to 6 oz per day.
- Serve juice in a cup, not a bottle. Juice served in a bottle can cover your child's teeth with sugar for long periods of time and contribute to tooth decay.
- Your child may not tell you when he is thirsty. Make sure he drinks plenty of water throughout the day, especially between meals and snacks.

How can I help my child get enough calcium?

- Serve foods that are rich in calcium, such as milk, cheese, yogurt, tofu processed with calcium sulfate, broccoli, and collard and turnip greens.
- Use milk products in recipes, such as in puddings, milkshakes, soups, and casseroles.
- Serve yogurt.
- If your child is lactose intolerant (that is, her digestive system cannot handle larger quantities of milk and other milk products), try these suggestions
  - Serve small portions of these foods throughout the day.
  - Serve these foods along with non-milk products.
  - Serve lactose-free milk products, yogurt, and aged hard cheeses, such as cheddar, Colby, Swiss, and Parmesan, which are low in lactose. Add lactase drops to your child's milk.
  - Give your child lactase tablets before she eats milk products containing lactose.
  - Serve calcium-fortified foods (foods that have added calcium), such as orange juice and cereal products.
- If these suggestions do not work, ask a health professional about giving your child a calcium supplement.

Should I give my child a vitamin and mineral supplement?

- If your child is growing and eats a variety of healthy foods, he does not need a vitamin and mineral supplement.
- Talk to a health professional if you are considering giving your child a vitamin and mineral supplement.

- Depending on your child's risk for developing tooth decay and the known level of fluoride in your child's drinking water, the dentist or physician may recommend giving your child a fluoride supplement.
- If your child does take a supplement, keep the bottle out of his reach. The supplements may look and taste like candy, and consuming too many at once can be harmful.

What should I do if my child is overweight?

- If your child is growing, eats healthy foods, and is physically active, you do not need to worry about whether she is overweight. However, if you have any concerns about your child's weight, talk with your child's health professional.
- Have your child's health professional check to make certain your child does not have any health problems.
- Allow your child to serve herself food, and help her learn to recognize internal hunger and fullness cues. When children are hungry, they may be irritable or tired or have difficulty focusing on a task. When they are full, they will begin eating more slowly or stop eating. Less subtle but equally important cues are ones that demand your attention, such as throwing food or utensils and playing with food.
- Let your child know that people come in many sizes and shapes and that you love her as she is. Never criticize your child's size, weight, or shape.
- If others comment on your child's size, weight, or shape, redirect their comments to your child's other attributes.
- Be a role model—practice healthy eating behaviors, and engage in regular physical activity.
- If your child does not eat enough healthy food or engage in enough physical activity, focus on gradually changing the entire family's eating behaviors and physical activity practices instead of singling out those of the child.
- Plan family activities that everyone enjoys (eg, hiking, biking, swimming).
- Limit your child's total entertainment media time (eg, watching television, playing computer or video games) to 1 to 2 hours of quality programming per day. Don't put a television in your child's bedroom; if one is already there, remove it.
- Serve scheduled meals and snacks.
- Do not forbid sweets and desserts. Serve them in moderation.
- Bring into the house only foods that you want your child to eat. Avoid buying high-calorie, low-nutrient foods in large quantities or on a regular basis.
- Never place your child on a diet to lose weight, unless a health professional recommends one for medical reasons and supervises it.

How can I help my child like her body?

- Be a positive role model—don't criticize your own size or shape or that of others.
- Focus on traits other than appearance when talking to your child.

Should my child eat low-fat foods?

- Reduced-fat (2%), low-fat (1%), and fat-free (skim) milk are not recommended for children younger than age 2, because infants and young children need fat for growth and development.
- After age 2, children should gradually increase the proportion of low-fat foods in their diets. As they begin to consume fewer calories from fat, children need more whole-grain breads and cereals, fruits and vegetables, low-fat or fat-free milk, lean meats, and other high-protein foods.
- Fatty fish, such as salmon, trout, and albacore tuna, are important for young children to eat.
- It is important for children to consume enough calories to grow well. When children are very active or having a growth spurt, their energy needs may be higher.

How can I prevent my child from choking?

- Have your child sit while eating. Eating while walking or running may cause him to choke.
- Keep things calm at mealtimes and snack times. If your child becomes overexcited, he may choke.

- Do not let your child eat in a moving car. If he chokes while you are driving, you will not be able to help him.
- For children younger than age 3, avoid foods that may cause choking (eg, hard candy, mini-marshmallows, popcorn, pretzels, chips, spoonfuls of peanut butter, nuts, seeds, large chunks of meat, hot dogs, raw carrots, raisins and other dried fruits, whole grapes).
- Children ages 3 to 5 may eat these foods if they are modified to make them safer (eg, cutting hot dogs in quarters lengthwise and then into small pieces, cutting whole grapes in half lengthwise, chopping nuts finely, chopping raw carrots finely or into thin strips, spreading peanut butter thinly on crackers or bread).

How can I encourage my child to be more physically active?

- Encourage active, spur-of-the-moment play (eg, jumping, hopping, skipping).
- Find acceptable indoor activities (eg, marching, dancing, tossing a bean bag).
- Play together (eg, dance, play hide and seek, kick a ball). It's a great way to spend time with your child.
- Limit your child's total entertainment media time (eg, watching television, playing computer or video games) to no more than 1 to 2 hours of quality programming a day. Don't put a television in your child's bedroom; if one is already there, remove it.
- For every hour your child reads, watches television, or plays computer or video games, encourage her to take a 10-minute physical activity or stretch break.
- Involve your child in family chores (eg, raking leaves, walking the dog).
- Plan at least one special physical activity (eg, a hike, a bike ride) each week.
- Work with community leaders to ensure that your child has safe places for engaging in physical activity (eg, walking and biking paths, playgrounds, parks, community centers).

What can I do to make grocery shopping with my child pleasant?

- Go shopping when neither you nor your child is hungry.
- Make a list in advance to save time while shopping.
- Use a safety belt when your child rides in a shopping cart.
- Bring toys to keep your child busy.
- Set clear rules for behavior (eg, no climbing out of the cart, no asking for candy), and praise your child for following the rules.
- Ask your child to help you look for food items.
- Talk to your child about what you are buying.
- If possible, do not rush your child. Children love to look around and discuss what they see.

What can I expect my child to do as he grows?

Although the skills listed are attainable for most children, some children—especially those with development disabilities—may not be able to master the skills at the ages indicated.

At ages 12–18 months, your child will

- Grasp and release foods with his fingers.
- Be able to hold a spoon (but will not be able to use it very well).
- Be able to use a cup (but will have difficulty letting go of it).
- Want foods that others are eating.

At ages 18–24 months, your child will

- Eat less than infants and than children ages 2 and older.
- Like to eat with his hands.
- Have favorite foods.
- Get distracted easily.

At ages 2–3, your child will

- Be able to hold a cup.
- Begin to place foods on own plate.
- Be able to chew more foods.
- Have definite likes and dislikes.

At age 3–4, your child will

- Be able to use a fork.
- Be able to hold a cup by its handle.
- Be able to pour liquids from a small pitcher.
- Request favorite foods.
- Like foods in various shapes and colors.
- Like to imitate the cook.
- Be influenced by television.

At ages 4–5, your child will

- Be able to use a knife and fork.
- Be able to use a cup well.
- Be able to feed himself.
- Be able to serve foods to herself.
- Be more interested in talking than in eating.

- Continue to have food jags (when he only wants to eat a particular food).
- Like to help prepare food.
- Be interested in where food comes from.
- Be more influenced by his peers.

RESOURCES FOR FAMILIES

Centers for Disease Control and Prevention. *Division of Nutrition, Physical Activity and Obesity.* http://www.cdc.gov/nccdphp/dnpa

Centers for Disease Control and Prevention. *Eat a Variety of Fruits & Vegetables Every Day.* http://www.fruitsandveggiesmatter.gov

International Food Information Council. *Kidnetic.* http://www.kidnetic.com

Nader PR, Zive MM. *You Can Lose Your Baby Fat: New Rules to Protect Kids from Obesity—For Parents, Providers, and Others Who Care About Children and the Future of Our Society*. San Diego, CA: Phil Nader Publications; 2008

National Institutes of Health, National Heart Lung, and Blood Institute. *We Can! Ways to Enhance Children's Activity & Nutrition.* http://www.nhlbi.nih.gov/health/public/heart/obesity/wecan

Nestle M. *What to Eat: An Aisle-by-Aisle Guide to Savvy Food Choices and Good Eating.* New York, NY: North Point Press; 2006

Nemours Foundation. *KidsHealth.* http://kidshealth.org

Satter E. *Your Child's Weight: Helping Without Harming: Birth Through Adolescence.* Madison, WI: Kelcy Press; 2005

US Department of Agriculture. *MyPyramid for Preschoolers.* http://www.mypyramid.gov/preschoolers

US Department of Agriculture, Food and Nutrition Information Center. *Food and Nutrition Fun for Preschoolers.* Beltsville, MD: US Department of Agriculture, Food and Nutrition Information Center; 2009

US Department of Agriculture, Food and Nutrition Service. *Eat Smart. Play Hard.* http://teamnutrition.usda.gov/Resources/eatsmartmaterials.html

US Department of Agriculture, Food and Nutrition Service. *Grow It, Try It, Like It! Preschool Fun with Fruits and Vegetables.* Washington, DC: US Department of Agriculture, Food and Nutrition Service; 2010

US Department of Agriculture, Food and Nutrition Service. *Loving Your Family, Feeding Their Future.* http://desearch.nal.usda.gov/cgi-bin/dexpldcgi?qry1355492943;1

US Department of Agriculture, Food and Nutrition Service. *Nibbles for Health: Newsletter for Parents of Young Children.* Washington, DC: US Department of Agriculture, Food and Nutrition Service; 2008

US Department of Agriculture, Food and Nutrition Service. *The Two Bite Club.* Washington, DC: US Department of Agriculture, Food and Nutrition Service; 2009

Virgilio SJ. *Active Start for Healthy Kids: Activities, Exercises, and Nutritional Tips.* Champaign, IL: Human Kinetics Publishers; 2005

Warner P. *Preschoolers Play and Learn: 150 Games and Learning Activities for Children Aged Three to Six.* Minnetonka, MN: Meadowbrook Press; 2000

Middle Childhood

Middle Childhood

CONTEXT

Middle childhood (ages 5–10) is characterized by a slow, steady rate of physical growth. However, cognitive, emotional, and social development occur at a tremendous rate during this period of a child's life.

To achieve optimal growth and development, children need to eat a variety of healthy foods that provide sufficient energy, protein, carbohydrates, fat, vitamins, and minerals. They need 3 meals per day, plus 1 or 2 snacks.

Children benefit greatly from practicing healthy eating behaviors. These behaviors are essential for

- Promoting optimal growth, development, and health
- Preventing immediate health problems (eg, iron-deficiency anemia, overweight and obesity, undernutrition, eating disorders, dental caries [tooth decay])
- Laying the foundation for lifelong health and reducing the risk for chronic diseases (eg, cardiovascular disease, type 2 diabetes mellitus, hypertension, some forms of cancer, osteoporosis)

GROWTH AND PHYSICAL DEVELOPMENT

Middle childhood's slow, steady rate of growth continues until the onset of puberty, which occurs in late middle childhood or early adolescence. During middle childhood, children gain an average of 7 lbs in weight, 2½ inches in height, and 1 inch in head circumference per year. They have growth spurts, which are usually accompanied by an increase in appetite and food intake. Conversely, a child's appetite and food intake decrease during periods of slower growth.

Body mass index (BMI) changes substantially during middle childhood. After age 2, BMI-for-age begins to decline, and it continues to decrease during the preschool years until it reaches its lowest point at around ages 5 to 6. Subsequently, BMI-for-age begins a gradual increase that is sustained through adolescence and into adulthood. The rebound or increase in BMI that occurs after it reaches its lowest point is referred to as BMI rebound and is reflected in the BMI-for-age and gender growth curves. This is a normal pattern of growth that occurs in all children. However, an early BMI rebound (occurring before ages 5–6), may be associated with obesity in adulthood.[1]

Body composition and body shape remain relatively constant during middle childhood. During preadolescence in girls (ages 9–11) and early adolescence in boys (ages 10–12), body fat percentage increases in preparation for the growth spurt that occurs during adolescence. In girls, the amount of the increase is greater than in boys. During preadolescence or early adolescence, girls in particular (but also boys) may appear "chunky," but this is part of normal growth and development. During middle childhood, boys have more lean body mass per inch of height than girls do.

During middle childhood, children may become overly concerned about their appearance. Girls especially may worry that they are overweight and may begin to eat less or diet. Parents should be aware of this possibility so that they can reassure their child that an increase in body fat during middle childhood is part of normal growth and development and is probably not a permanent change. Boys may become concerned about their stature and muscle size and strength. Parents and children should be aware that muscle-building activities (eg, weightlifting) during this period can be harmful. Boys are unable to increase their muscle mass until middle adolescence although, with appropriate physical activity, they can improve their muscle strength.

Most children begin to lose their primary teeth during middle childhood, and permanent teeth begin to erupt. When children are missing several teeth or are undergoing orthodontic treatment, it may be difficult for them to chew certain foods, such as meat. Offering chopped meats and softer foods can help ensure that children are able to eat a healthy diet.

DEVELOPMENT ISSUES

In the early stages of middle childhood, children describe foods according to color, shape, and quantity and classify foods as ones they like and don't like. They may be able to identify foods that are healthy but may not know why they are healthy. As children mature, they begin to realize that eating healthy food has a positive effect on growth and health.

Children in middle childhood begin to develop a sense of self and to learn their roles in the family, at school, and in the community. Their ability to feed themselves improves, they can help with meal planning and food preparation, and they can perform tasks related to mealtime. Performing these tasks enables children to contribute to the family, thereby boosting their self-esteem.

During middle childhood, mealtimes take on more social significance, and outside sources (eg, peers, the media) begin to exert more influence over children's attitudes toward eating behaviors and food. In addition, children eat more meals away from home (eg, at child care facilities, at school, and at the homes of friends and relatives). The degree to which they are willing to eat certain foods and to participate in nutrition programs (eg, the National School Lunch Program) may be influenced by what their friends are doing.

Parents continue to have the most influence on children's eating behaviors and attitudes toward food. Parents need to make healthy foods available at home and to limit the availability of high-calorie, low-nutrient foods. Parents should be positive role models by practicing healthy eating behaviors themselves. Children's food intake is strongly associated with what their parents eat.

It is important for families to eat meals together in a pleasant environment, allowing time for social interaction and family togetherness. This can become more difficult as children get more involved in extracurricular activities. Children who eat dinner with their families have a higher-quality diet, including greater intake of fruits, vegetables, milk products, vitamins, and minerals, and decreased soft drink consumption.[2] The proportion of children that eat dinner with their families decreases with the age of the child, and eating as a family becomes more challenging as children approach adolescence.[2]

Many children walk to neighborhood stores and fast-food restaurants and purchase food with their own money. Parents need to provide guidance to help children make healthy food choices away from home.

HEALTHY LIFESTYLES

Children can achieve substantial health benefits by doing moderate- and vigorous-intensity physical activity for a total of 60 minutes or more each day. This should include aerobic activity as well as age-appropriate muscle- and bone-strengthening activities. It appears that the total amount of physical activity is more important for achieving health benefits than any one component (frequency, intensity, or duration) or the specific mix of activities (aerobic, muscle strengthening, or bone strengthening). Even so, bone-strengthening activities remain especially important for children because the greatest gains in bone mass occur during the years just before and during puberty.[3]

Children who are physically active
- Have higher levels of cardiorespiratory fitness and stronger muscles
- Typically have less body fat
- Have stronger bones
- May have reduced symptoms of anxiety and depression

During middle childhood, children's muscle strength, motor skills, and stamina increase. Children acquire the motor skills necessary to perform complex movements, allowing them to engage in a variety of physical activities. Children are motivated to be physically active by having fun, feeling competent, and engaging in a variety of activities.

Parents play a major role in determining children's physical activity levels. By being physically active (eg, biking, hiking, playing basketball or baseball) with their child, parents emphasize the importance of regular physical activity and show their child that physical activity can be fun. When parents encourage children to be physically active, children's physical activity levels significantly increase.[4]

Physical education at school should be provided every day, and enjoyable activities should be offered. Teachers and children's friends influence a child's level of physical activity. Children may be more interested in activities in which their friends are engaging. Participating in physical activity programs helps children learn to cooperate with others.

Middle childhood is an appropriate time to begin discouraging children from using tobacco products and drinking alcohol.

BUILDING PARTNERSHIPS

Middle childhood provides an opportunity for health professionals, families, and communities to teach children about healthy eating behaviors, encourage positive attitudes toward food and eating, and promote regular physical activity.

Health professionals can give parents the opportunity to discuss nutrition issues and concerns about their children and can identify and contact community resources to help parents feed their children.

Children need a variety of healthy foods served in a pleasant environment. Nutrition education should be part of the education curriculum, and child care facilities and schools should serve a variety of healthy foods that children learn about in the classroom. Federally funded school meal programs help provide children with a substantial part of their daily nutrient requirements. (See Tool K: Federal Nutrition Assistance Programs.) Food shelves and pantries, community groups, and faith-based organizations can also provide food.

Communities need to provide physical activity programs (eg, at child care facilities, schools, recreation centers) and safe places for children to play.

COMMON NUTRITION CONCERNS

Common nutrition concerns during middle childhood include the following:
- Decrease in consumption of milk and milk products
- Increase in consumption of sweetened beverages, especially soft drinks
- Limited intake of fruits and vegetables
- Higher consumption than recommended of foods high in fat, especially saturated and trans fats
- Rise in overweight and obesity
- Increase in body image concerns

There are many barriers that may prevent children from eating healthy foods and being physically active. Some children do not have opportunities to be physically active, and some live in unsafe neighborhoods. Children who experience poverty or neglect may lack access to the foods they need to stay healthy. Foods that are high in sugar and fat, especially those high in saturated and trans fats, are readily available, and media messages encourage children to eat them. A study of commercials aired during children's television programming on Saturday morning showed that almost 50% of commercials focus on food, with 9 out of 10 of these commercials focusing on foods that are high in fat, sodium, or added sugars or low in nutrients.[5] Children who use the Internet are subjected to food marketing in new forms, such as "advergames" (online games that feature a company's product or brand character) or "advercation" (a combination of advertising and education).[6]

For a list of risk factors that can lead to poor nutrition status, see Tool D: Key Indicators of Nutrition Risk for Children and Adolescents. If there is evidence that a child is at risk for poor nutrition, further assessment is needed, including a nutritional assessment, laboratory tests, or both.

Nutrition Supervision

A child's nutrition status should be evaluated during nutrition supervision visits or as part of health supervision visits. (For more information on health supervision, see *Bright Futures: Guidelines for Health Supervision of Infants, Children, and Adolescents,* Third Edition, listed under Suggested Reading in this chapter.) It is important to remember that nutrition supervision, which includes asking interview questions, conducting screening and assessment, and providing anticipatory guidance, should be used as appropriate and will vary from visit to visit and from child to child.

Health professionals begin nutrition supervision by selectively asking interview questions about the child's nutrition status, to invite discussion and build partnerships. Use of the questions may vary from visit to visit and from family to family. Questions can be modified to match the health professional's communication style. Gathering information can also be accomplished by reviewing a questionnaire filled out by parents before the visit. (See Tool B: Nutrition Questionnaire for Children Ages 1 to 10.) Additionally, to meet the challenge of providing nutrition supervision to diverse populations, health professionals need to appreciate the variety of cultural traditions related to food and the wide variation in food practices within and among cultural groups. (See the Cultural Awareness in Nutrition Services chapter.) Asking interview questions provides a useful starting point for identifying a child's nutrition concerns.

Interview Questions

Eating Behaviors and Food Choices

FOR THE CHILD

- Which meals do you usually eat each day? How many snacks?
- How often does your family eat meals together?
- Where did you eat yesterday? At school? At home? At a friend's house?
- What do you usually eat and drink in the morning? Around noon? In the afternoon? In the evening? Between meals?
- What snacks do you usually eat?
- What is your favorite food?
- Are there any foods you won't eat? If so, which ones?
- What do you usually drink with your meals? With snacks?
- What fruits and vegetables, including juices, did you eat or drink yesterday?

FOR THE PARENT

- How often does your family eat meals together?
- Do you have any concerns about your child's eating habits or behaviors (eg, getting her to drink enough milk)?
- Do you think your child eats healthy foods? Why or why not?
- How often does your child eat breakfast?
- What does he usually eat for snacks?
- Where does your child eat snacks? At home? At school? At after-school care? At a friend's house?
- What does he usually drink (eg, milk, water, fruit juice, fruit drinks, soft drinks)?

Food Resources

FOR THE CHILD OR PARENT

- Who usually buys the food for your family? Who prepares it?
- Are there times when there is not enough food to eat or not enough money to buy food?

Weight and Body Image

FOR THE YOUNGER CHILD

- How do you feel about your weight?

FOR THE OLDER CHILD

- How do you feel about your weight?
- How much would you like to weigh?
- Are you trying to change your weight? If so, how?

FOR THE PARENT

- How do you feel about your child's weight?

Physical Activity

FOR THE CHILD

- What do you do to be physically active? How often?
- How much time do you spend being active in a week?
- How much time do you spend each day watching television and playing computer or video games?
- What do you think you can do to be more active?

FOR THE PARENT

- What types of physical activity does your child engage in? How often?
- How much time does your child spend each day watching television or playing computer or video games?
- Does your child have a television in his bedroom?

Screening and Assessment

Growth and Physical Development

- Measure the child's height and weight, and plot these on a standard growth chart. Deviation from the expected growth pattern (eg, a major change in growth percentiles on the chart) should be evaluated. This may be normal or may indicate a nutrition problem (eg, difficulties with eating).
- Height and weight measurements can be used to indicate nutrition and growth status. Changes in weight reflect a child's short-term nutrient intake and serve as general indicators of nutrition status and overall health. Low height-for-age may reflect long-term, cumulative nutrition or health problems.
- Body mass index is used as a screening tool to determine nutrition status and overall health. Calculate the child's BMI by dividing weight by the square of height (kg/m^2) or using a BMI wheel or calculator. To interpret BMI, plot the child's BMI and age on a BMI-for-age growth chart to determine the child's BMI percentile.
- Some children may have a high BMI percentile because of a large, lean body mass resulting from physical activity, muscularity, or frame size. An elevated skinfold (ie, above the 95th percentile on growth charts) can confirm excess body fat in children.
- Evaluate the appearance of the child's skin, hair, teeth, gums, tongue, and eyes.
- Obtain the child's blood pressure. (See the Hypertension chapter.)
- Assess the child's risk for familial hyperlipidemia. (See the Hyperlipidemia chapter.)

Table 1 provides an overview of indicators of height and weight status. When a child is outside the healthy weight range, a more in-depth assessment may be needed. Body mass index serves only as a screening tool and should not be used as a diagnostic tool.

TABLE 1. INDICATORS OF HEIGHT AND WEIGHT STATUS

Indicator	Anthropometric Variable	Cut-Off Values
Stunting	Height-for-age	<3rd percentile
Underweight	BMI-for-age	<5th percentile
Healthy weight	BMI-for-age	≥5th–84th percentiles
Overweight	BMI-for-age	≥85th–94th percentiles
Obesity	BMI-for-age	≥95th percentile

Sources: World Health Organization,[7] Barlow et al,[8] and Krebs et al.[9]

Stunting

- Children whose height-for-age is below the third percentile should be evaluated. Stunting reflects a failure to reach optimum height as a result of poor nutrition or poor health.[7] Most children with low height-for-age are short as a result of genetics, not because their growth is stunted. Stunting has been reported in children with severely inadequate energy intakes or chronic illnesses. The goal is to identify children whose growth is stunted and who may benefit from improved nutrition or treatment of other underlying problems. Children with special health care needs may have low height-for-age because of a genetic disorder, chronic eating problems, an altered metabolic rate, malabsorption syndrome, or other conditions. All of these factors should be assessed, and interventions should be implemented to help children reach the height that they have the potential to achieve. A referral to an endocrinologist may be necessary to rule out growth hormone or thyroid deficiency.

Underweight

- Children with a BMI below the fifth percentile should be assessed for organic disease and eating disorders. Children may be thin naturally, or they may be thin as a result of inadequate energy intake, inadequate food resources, restrictive dieting, a nutritional deficit, or a chronic disease.

Overweight

- Children with a BMI between the 85th and 94th percentiles are considered overweight and need further screening.[8] (See the Obesity chapter.)

Obesity

- Children with a BMI at or above the 95th percentile are considered obese and need an in-depth medical assessment.[9] Children with a BMI at or above the 99th percentile are at highest risk for comorbidities associated with excessive weight. However, there is no consensus on a definition of severe obesity in children. The expert committee suggested using the 99th percentile based on cutpoints from National Health and Nutrition Examination Survey data.[10] These cutpoints may be imprecise, but children with a BMI at or above this level are at higher risk for comorbidities compared with children with BMIs in the normal range, and therefore intervention is urgent. (See the Obesity chapter.)

Iron-Deficiency Anemia

- Recommendations for iron-deficiency anemia screening have been put forth by the American Academy of Pediatrics (AAP) and the Centers for Disease Control and Prevention (CDC). (See the Iron-Deficiency Anemia chapter.)
  - The AAP recommends screening children who are consuming a strict vegetarian diet without iron supplementation.[11]
  - The CDC recommends screening children with known risk factors for iron-deficiency anemia (eg, low iron intake, special health care needs, previous diagnosis of iron-deficiency anemia).[12]

Oral Health

- Ask whether the child has regular dental visits.
- Assess eating behaviors (eg, frequency of consuming foods and beverages high in sugar) to determine the child's risk for dental caries (tooth decay). (See the Oral Health chapter.)

Physical Activity

- Assess the child's level of physical fitness by
  - Asking how much physical activity the child engages in on a weekly basis
  - Evaluating how the child's physical fitness compares to national standards (eg, how well the child did on the school's standardized physical fitness assessment)
  - Evaluating the child's motor skills and appropriateness of physical activities (Table 2)
- For physical activity characteristics associated with an increased likelihood of poor nutrition, see Tool D: Key Indicators of Nutrition Risk for Children and Adolescents. If there is evidence of nutrition risk, further assessment should be conducted, including a nutrition assessment, laboratory tests, or both.
- Screen for the amount of time the child spends watching television and on other media activities, such as computer or video games. Ask whether the child watches television during mealtimes.

TABLE 2. MOTOR SKILLS DEVELOPMENT AND APPROPRIATE PHYSICAL ACTIVITY

Ages	Motor Skills	Recommended Physical Activities
5–6	Fundamental (eg, running, galloping, jumping, hopping, skipping, throwing, catching, kicking)	Focus on having fun and developing motor skill rather than on competition Are simple activities that require little instruction Are repetitive and do not require complex motor and cognitive skills (eg, running, swimming, tumbling, throwing and catching a ball)
7–9	Fundamental transitional (eg, throwing for distance, throwing for accuracy)	Focus on having fun and developing motor skill rather than on competition Have flexible rules Require little instruction Do not require complex motor and cognitive skills (eg, entry-level baseball, soccer)
10–11	Transitional complex (eg, playing basketball)	Focus on having fun and developing motor skill rather than on competition Require entry-level complex motor and cognitive skills Continue to emphasize motor skill development but begin to incorporate instruction on strategy and teamwork

Source: Patrick et al.[13]

Anticipatory Guidance

Anticipatory guidance should address the child's and parents' nutrition concerns. In addition, health professionals should offer information on the child's nutrition status; make the child and parents aware of what to expect as the child enters the next developmental period; and promote a positive attitude about eating behaviors, food choices, and physical activity. (For additional information, see Tool F: Stages of Change—A Model for Nutrition Counseling, and Tool G: Strategies for Health Professionals to Promote Healthy Eating Behaviors.)

Growth and Physical Development

- Discuss physical development with the child and parents, including the approximate times when they should expect accelerated growth. For girls, this may occur at ages 9 to 11; for boys, it may occur at ages 10 to 12.
- Explain the standard growth chart to the child and parents, and discuss how the child compares to others his age. Emphasize that a healthy body weight is based on a genetically determined size and shape rather than on an ideal, socially defined weight. (See Tool I: Tips for Fostering a Positive Body Image Among Children and Adolescents.)
- Tell the child and parents what a healthy weight is. Help the child understand that people come in unique sizes and shapes, within a range of healthy body weights. All children need to know they are loved and accepted by their families as they are, regardless of their size and shape.
- Explain to children that some of their peers may start puberty earlier or later than they do, but that they are still normal.
- Discuss with the child and parents the physical changes that the child can expect to experience in the near future, as well as specific concerns.
- Emphasize to the child and parents the importance of eating healthy foods and being physically active to achieve or maintain a healthy weight.
- Explain to the child and parents that weight loss should not occur in children with a BMI below the 95th percentile, but a gradual weight loss of no more than 1 lb a month may be appropriate for children with a BMI between the 95th and 99th percentiles. For children with a BMI above the 99th percentile, a maximum of 2 lbs a week may be appropriate. But, even if they are losing weight, children need to consume sufficient calories and nutrients for growth and development.[8]

Eating Behaviors and Food Choices

- Discuss with the child and parents the importance of healthy eating. Provide guidance to the child on increasing the variety of foods she eats and guidance to parents on incorporating new foods into their child's diet.

- Encourage the child to make healthy food choices based on the *Dietary Guidelines for Americans*[14] and on *MyPyramid*.[15] (See the Healthy Eating and Physical Activity chapter.) For example, encourage the child to eat fruits, vegetables, grain products (especially whole grain), low-fat and fat-free milk products (eg, milk, cheese, yogurt), lean meats, poultry, fish, beans, eggs, and nuts.
- Explain to parents that energy requirements remain fairly constant during middle childhood and are influenced by growth, physical activity level, and body composition. Boys and girls need approximately the same number of calories per day until the beginning of their growth spurts, when calorie needs increase. Dietary Reference Intakes provide energy requirements based on activity levels. Children who are very active require more calories than children who are less active.[16,17]
- Tell parents that children ages 2 to 8 need to drink 2 cups of low-fat (1%) or fat-free (skim) milk or consume the equivalent from other milk products (eg, yogurt, cheese) per day to meet their calcium needs. Eating foods that provide enough calcium, such as milk, yogurt, and cheese, to attain maximum bone density helps prevent osteoporosis and bone fractures later in life.
- Tell parents that children ages 9 and older need to drink 3 cups of low-fat (1%) or fat-free (skim) milk or consume the equivalent from other milk products (eg, yogurt, cheese) per day to meet their calcium needs.
- Tell parents that to prevent rickets and vitamin D deficiency, children who do not obtain 400 IU/day of vitamin D through vitamin D–fortified milk (100 IU per 8-oz serving) and vitamin D–fortified foods (eg, fortified cereals, eggs [yolk]) should receive a vitamin D supplement of 400 IU/day.[18]
- Emphasize to parents that children need to eat regular healthy meals and snacks. Discuss the importance of having regular family meals.
- Tell parents that children in middle childhood cannot consume large amounts of food at one time and therefore need 1 to 2 snacks daily to ensure that they are eating a healthy diet. Help children choose healthy snacks rich in complex carbohydrates (eg, whole-grain products, fresh fruits and vegetables).
- Encourage parents to limit foods high in fat, especially those high in saturated and trans fats (eg, chips, french fries), and foods (eg, candy, cookies) and beverages (eg, fruit drinks, soft drinks) high in sugar.
- Encourage parents to promote drinking water when their child is thirsty and to limit intake of juice and sweetened beverages.
- Discuss with parents that children should be offered healthy choices at meals. Mealtimes at home, school, restaurants, and other places can be used to teach children to make healthy food choices.
- Encourage parents to provide a relaxed atmosphere for mealtimes and to get rid of distractions such as the television. Well-balanced meals and snacks should be offered in a pleasant environment. When children are stubborn about eating, it is often their way of learning to be independent. Fighting over food may make them even more stubborn.
- Encourage parents to enroll their child in school breakfast and lunch programs if needed. (See Tool K: Federal Nutrition Assistance Programs.)

Oral Health

- Explain to parents that toothbrushing requires good fine motor control and that young children cannot clean their teeth without parental help. After children acquire fine motor skills (eg, the ability to tie their shoelaces), typically by age 7 or 8, they can clean their teeth effectively.
- Encourage the child to brush his or her teeth with fluoridated toothpaste twice a day (after breakfast and before bed).
- Tell parents that limiting their child's consumption of foods (eg, candy, cookies) and beverages (eg, fruit drinks, soft drinks) high in sugar can help prevent dental caries (tooth decay).
- Explain to parents that drinking fluoridated water is a safe and effective way to significantly reduce the risk for dental caries (tooth decay) in children. (See the Oral Health chapter.) For families that prefer bottled water, a brand in which fluoride is added at a concentration of approximately 0.8 to 1.0 mg/L (ppm) is recommended.[19]

Physical Activity

- Encourage the child to engage in 60 or more minutes of daily physical activity. Explain to the child the following guidelines:[3]
  - Aerobic: Most of the 60 or more minutes or more a day should be either moderate-intensity (eg, hiking, skateboarding) or vigorous-intensity (eg, running, bicycling) aerobic physical activity and should include vigorous-intensity physical activity at least 3 days a week.
  - Muscle-strengthening: As part of the 60 or more minutes of daily physical activity, children should include muscle-strengthening physical activity (eg, climbing trees, sit-ups) at least 3 days a week.
  - Bone-strengthening (weight-bearing): As part of their 60 or more minutes of daily physical activity, children should include bone-strengthening physical activity (eg, jumping rope, playing basketball) at least 3 days a week.
- Encourage parents of children with special health care needs to allow their child to engage in regular physical activity for cardiovascular fitness (within the limits of the child's medical or physical conditions). Explain that adaptive physical education is often helpful and that a physical therapist can help identify appropriate activities for the child with special health care needs. (See the Children and Adolescents With Special Health Care Needs chapter.)
- Emphasize to the child and parents the importance of physical activity. Encourage the older child to stay active during adolescence, when physical activity tends to decline.
- Encourage the child to find physical activities he enjoys and can incorporate into his daily life. These activities tend to be continued into adulthood.
- Emphasize to the child and parents the importance of wearing safety equipment (eg, helmets, pads, mouth guards, goggles) when the child is physically active. Also, suggest that the parent check surfaces under playground equipment to ensure that materials such as mulch chips, pea gravel, fine sand, or shredded rubber are present to cushion a fall.
- If the safety of the environment or neighborhood is a concern, help parents and the child find other settings for physical activity.
- Explain to parents that most elementary schools include physical education in their curricula and that school physical education programs usually conduct physical fitness testing when children are in middle childhood. Encourage parents to bring the results of their child's fitness testing to discuss results as well as suggestions for improvement.
- Tell parents that for children who engage in organized sports, adequate fluid intake is very important. Before puberty, children are at increased risk for heat-related illness because their sweat glands are not fully developed, and they cannot cool themselves as well as adolescents or adults can. Encourage parents to make sure that their child drinks adequate fluids. (See the Healthy Eating and Physical Activity chapter.)
- Explain to parents about the effects of television and media viewing. Encourage them to turn off the television during mealtimes and not have a television in the child's bedroom. Limit the child's total entertainment media time (eg, watching television, playing computer or video games) to no more than 1 to 2 hours of quality programming a day.[20]
- Encourage the child, especially if she is overweight or obese, to reduce sedentary behaviors.

Substance Use

- Warn parents and the child about the dangers of alcohol, tobacco, and other drugs.
- Warn parents and the child about the dangers of performance-enhancing products (eg, protein supplements, anabolic steroids).

The desired outcomes for the child and the role of the family outlined in Table 3 can assist health professionals in promoting optimal nutrition.

TABLE 3. DESIRED OUTCOME FOR THE CHILD, AND THE ROLE OF THE FAMILY

	Educational/Attitudinal	Behavioral	Health
Desired Outcomes for the Child	Understands that healthy eating behaviors and regular physical activity are crucial to growth, development, and health Understands the importance of eating a variety of healthy foods and how to increase food variety Understands the importance of a healthy diet consisting of 3 meals per day and 1 to 2 snacks as needed Understands the physical, emotional, and social benefits of physical activity and how to increase physical activity level Understands that people come in unique body sizes and shapes, within a range of healthy body weights	Consumes a variety of healthy foods Makes healthy food choices at and away from home Engages in at least 60 minutes of physical activity on most, and preferably all, days of the week Watches television or plays computer or video games no more than 1 to 2 hours of quality programming a day	Maintains optimal nutrition to promote growth and development Achieves nutritional and physical well-being, without signs of iron-deficiency anemia, undernutrition, obesity, eating disorders, dental caries (tooth decay), or other nutrition-related problems Achieves and maintains a healthy body weight and positive body image
Role of the Family	Understands physical changes that occur with growth and development Understands the relationship between nutrition and short- and long-term health Understands children's eating behaviors and how to increase the variety of healthy foods they eat Understands the importance of a healthy diet consisting of 3 meals per day and snacks as needed Understands the importance of family meals Understands that people come in unique body sizes and shapes, within a range of healthy body weights Understands the dangers of unsafe weight-loss methods and knows safe ways to achieve and maintain a healthy weight	Provides a positive role model: practices healthy eating behaviors, engages in regular physical activity, and promotes a positive body image Provides a variety of healthy foods at home, and limits the availability of high-sugar and high-fat foods, especially those high in saturated and trans fats Eats meals together regularly to ensure optimal nutrition and facilitate family communication Provides opportunities for the child to participate in meal planning and food preparation Uses nutrition programs and food resources if needed Engages in regular physical activity with the child	Provides developmentally appropriate, healthy foods and modifies them if necessary Helps the child achieve and maintain a healthy weight Provides opportunities and safe places for the child to engage in physical activity

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The Importance of Healthy Snacks

Melanie Walker is a 6-year-old who has just started first grade. She eats breakfast at home and participates in the school lunch program at her elementary school, where she eats lunch every day at 11:00 am. The school does not have a regularly scheduled snack in the afternoon. By the time Melanie gets home from school at around 3:30 pm, she is hungry, tired, and cranky.

Last year Melanie attended a morning kindergarten class and spent 3 afternoons a week at a child care facility. At the time she was eating breakfast at home, a snack at 9:30 am, lunch at 11:30 am, and another snack at 3:00 pm. Melanie didn't seem to be as hungry, tired, or cranky at the end of the afternoon as she is now.

Mr and Mrs Walker share their concerns with the teacher and the principal. As a result, the school authorizes a regular afternoon snack for children who eat lunch early.

Melanie's parents talk with a nutritionist who suggests that they meet with the teacher and the principal to discuss adding an afternoon snack. Mr and Mrs Walker and the parents of other children in Melanie's class share their concerns with the teacher and the principal during an after-school meeting, and the nutritionist shares information on the importance of healthy snacks in children's diets. As a result, the school authorizes a regular afternoon snack for children who eat lunch early.

Frequently Asked Questions About Nutrition in Middle Childhood

How can I encourage my child to eat healthy foods?

- Serve new foods and regional and ethnic foods.
- Shop for foods and cook together.
- Be a positive role model—practice healthy eating behaviors yourself.
- Don't fight over food with your child, and do not prepare separate foods for him.
- Avoid using food as part of a reward system.
- Keep a variety of healthy foods in the house. Limit the availability of foods (eg, candy, cookies) and beverages (eg, soft drinks) high in sugar and fat, especially saturated and trans fats.
- Plant a garden.

How can our family eat healthy meals together when we are so busy?

- Make food preparation and cooking an enjoyable family activity.
- Eat different meals together. For example, eat breakfast together one day and lunch or dinner the next.
- Make simple meals (eg, salads, soups, sandwiches).
- Buy healthy, ready-to-eat foods from the store or healthy take-out foods from a restaurant.
- When your family eats together, use the time to socialize. Avoid distractions. Turn the television off, and don't answer the telephone.
- Try to prioritize family meals, and strive to eat 4 meals (breakfast, lunch, or dinner) together a week.

How can I get my child to eat breakfast?

- Provide foods that are fast and convenient (eg, bagels, low-fat granola bars, fruit, 100% fruit juice [limit to 6–8 oz per day], yogurt).
- Serve foods other than the usual breakfast foods (eg, sandwiches, baked potatoes, leftovers such as chicken or pasta).
- Help your child get organized so that she has time to eat in the morning.
- Make breakfast the night before.
- If your child is in a hurry, offer her foods such as fruit or trail mix to eat at school.
- See if your school offers a breakfast program.

How can I get my child to eat more fruits and vegetables?

- Keep a variety of fruits and vegetables at home.
- Put cut-up fruits and vegetables on the counter when you know your teenager will be hungry.
- Wash and cut up fruits and vegetables, and keep them in the refrigerator along with low-fat dip or salsa. Use a clear container so that the fruits and vegetables can be seen easily.
- Serve 2 or more vegetables with dinner, including at least one your child likes. Serve a salad with a choice of low-fat dressing.
- Use plenty of vegetables in soups, sauces, and casseroles.
- Pack fruits and vegetables in your child's bag to eat at school.
- Offer a variety of fruits and vegetables at meals and snacks, but don't force your child to eat them.
- Plant a garden.
- Be a good role model—eat more fruits and vegetables yourself.

How can I help my child get enough calcium?

- Serve foods that are rich in calcium, such as low-fat (1%) or fat-free (skim) milk products (eg, milk, cheese, cottage cheese, yogurt), tofu processed with calcium sulfate, broccoli, and collard and turnip greens.
- Use low-fat or fat-free milk products in recipes (eg, in puddings, milkshakes, soups, casseroles).
- If your child's digestive system cannot handle milk and milk products (ie, he is lactose intolerant), try these suggestions.
  - Serve small portions of these foods throughout the day.
  - Serve these foods along with non-milk products.
  - Serve lactose-free milk products, including milk and yogurt, and aged hard cheeses (eg, cheddar, Colby, Swiss, Parmesan) that are low in lactose. Add lactose drops to your child's milk.
  - Give your child lactase tablets before she eats milk products containing lactose.
  - Serve foods, such as 100% juice (limit to 6–8 oz per day) and cereal products, with added calcium (calcium-fortified).
- If these ideas do not work, ask a health professional about giving your child a calcium supplement.

My child has become a vegetarian. Should I be concerned?

- With careful planning, a vegetarian diet can be healthy and can meet children's nutritional needs.
- A vegetarian diet that includes milk products and eggs usually provides adequate nutrients; however, your child may need to take an iron supplement.
- Vegans are strict vegetarians who don't eat any animal products, including dairy foods, eggs, or fish. They may need additional calcium, vitamin B_{12}, and vitamin D, which can be provided by fortified foods and supplements.
- Instead of always preparing separate vegetarian meals for your child, occasionally fix vegetarian meals for the whole family.
- Ask a registered dietitian or nutritionist to help you plan healthy meals.

How can I teach my child to make healthy food choices away from home?

- Encourage your child to make healthy food choices when purchasing food at school, stores, and restaurants, and from vending machines.
- Review school and restaurant menus with your child, and discuss healthy food choices and appropriate portions. Find foods that are low in fat, sugar, and calories.
- Encourage your child to eat salads with low-calorie dressing, fruits, vegetables, and broiled or baked meats.
- Encourage your child to avoid eating fried foods or to reduce the serving size (eg, by splitting an order of french fries with a friend).
- Teach your child to ask for changes to make foods healthier, such as asking the server to "hold the mayonnaise."

My child snacks on chips and candy. What should I do?

- Limit foods in your home that are high in fat, such as potato chips that are fried, and high in sugar, such as candy and sweetened beverages (eg, fruit drinks, soft drinks).
- Keep a variety of easy-to-prepare and healthy foods on hand.
- Serve healthier foods (eg, whole-grain low-fat products, 100% fruit juice [limit to 6–8 oz per day], fruit, applesauce, vegetables, yogurt).
- Wash and cut up vegetables, and keep them in a clear container (so they can be seen easily) in the refrigerator, along with low-fat dip or salsa. Keep them at your child's eye level so they are the first thing the child sees when he opens the fridge.
- Keep a bowl of fruit on the table or counter.
- Encourage your child to make healthy food choices when purchasing food at school, stores, and restaurants, and from vending machines.

How can I help my child be more active?

- Encourage spur-of-the-moment physical activity (eg, dancing to music).
- Limit your child's total entertainment media time (eg, watching television, playing computer or video games) to no more than 1 to 2 hours of quality programming a day. Don't put a television in your child's bedroom; if one is already there, remove it.
- For every hour your child reads, watches television, or plays computer or video games, encourage her to take a 10-minute physical activity break.
- Involve your child in family chores (eg, raking leaves, walking the dog).
- Make physical activity a part of your child's daily life. For example, use the stairs instead of taking an elevator or escalator, and walk or ride a bike instead of riding in a car.
- Enroll your child in planned physical activities (eg, swimming, martial arts, dancing).
- Be physically active together, (eg, biking, playing ball, dancing, skating). It's a great way to spend time with your child.
- Take turns selecting physical activities that family members and friends can do together.
- Plan at least one special physical activity (eg, a hike, a bike ride) each week.
- Be a good role model—engage in regular physical activity yourself.

What should I do if my child is overweight?

- If you are concerned about your child's weight, bring this to the attention of your child's health professional, and request an evaluation of your child's BMI.
- Never place your child on a diet to lose weight, unless a health professional recommends one for medical reasons and supervises it.
- Focus on gradually changing the entire family's eating and physical activity behaviors.
- Serve healthy meals and snacks at scheduled times, but allow for flexibility.
- Limit foods that are high in fat, such as fried potato chips, and foods that are high in sugar, such as candy and sweetened beverages (eg, fruit drinks, soft drinks).
- Limit most beverages to low-fat or fat-free milk, water, and 100% fruit juice (limited to 6 oz per day).
- Serve low-fat or fat-free milk products.
- Do not forbid sweets and desserts. Serve them in moderation.
- Look at school menus with your child, and discuss healthy food choices and appropriate portions.
- Plan family activities that everyone enjoys (eg, hiking, biking, swimming).
- Limit to 1 to 2 hours per day the amount of time your child watches television and plays computer or video games.
- Be a good role model—practice healthy eating behaviors and engage in regular physical activity yourself. Children need at least 60 minutes of moderate to vigorous activity each day.
- Work with your community to make sure that your child has safe places for being physically active (eg, walking and biking paths, playgrounds, parks).
- Do not make negative comments about their weight or allow teasing about weight by other family members.

How can I help my underweight child gain weight?

- Limit the quantity of beverages your child drinks between meals if his appetite is being affected.
- Serve an after-school snack, and encourage your child to eat a midmorning snack at school, if possible. Limit snacks close to mealtimes if snacking is affecting his appetite.
- Involve your child in meal planning and food preparation.
- Continue to offer foods even if your child has refused to eat them before. Your child is more likely to accept these foods after they have been offered several times.

How can I help my child like her body?

- Children are sensitive about how they look. Do not criticize your child about his size or shape.
- Focus on traits other than appearance when talking to your child.
- Talk to your child about how the media affects his body image.
- Be a good role model—don't criticize your own size or shape or that of others.

If you notice any of these symptoms, talk to a health professional about your concerns.

ANOREXIA NERVOSA

- Excessive weight loss in a short period
- Continuation of dieting although thin
- Dissatisfaction with appearance; belief that body is fat even though extremely thin
- Unusual interest in certain foods, and development of unusual eating rituals
- Eating in secret
- Obsession with exercise
- Depression

BULIMIA NERVOSA

- Unusual interest in certain foods and development of unusual eating rituals
- Eating in secret
- Obsession with exercise
- Depression
- Binge-eating
- Binge-eating with no noticeable weight gain
- Vomiting or laxative use
- Disappearance into bathroom for long periods (eg, to induce vomiting)

RESOURCES FOR FAMILIES

Centers for Disease Control and Prevention. Division of Nutrition, Physical Activity and Obesity. http://www.cdc.gov/nccdphp/dnpa

Centers for Disease Control and Prevention. *Eat a Variety of Fruits & Vegetables Every Day.* http://www.fruitsandveggiesmatter.gov

International Food Information Council. *Kidnetic.* http://www.kidnetic.com

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US Department of Agriculture, Food and Nutrition Service. *Eat Smart. Play Hard.* http://teamnutrition.usda.gov/Resources/eatsmartmaterials.html

US Department of Agriculture, Food and Nutrition Service. *Empowering Youth with Nutrition and Physical Activity.* http://healthymeals.nal.usda.gov/hsmrs/EY

US Department of Agriculture, Food and Nutrition Service. *Loving Your Family, Feeding Their Future.* http://snap.nal.usda.gov/nal_display/index.php?info_center=15&tax_level=3&tax_subject=261&topic_id=1941&level3_id=6322&level4_id=0

US Department of Agriculture, Food and Nutrition Service. *Team Nutrition.* http://www.fns.usda.gov/tn

Adolescence

Adolescence

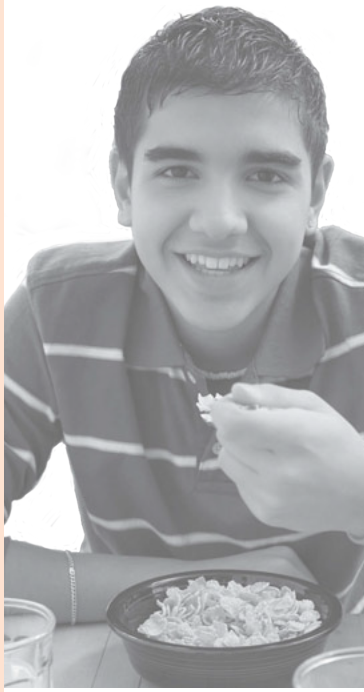
CONTEXT

Adolescence (ages 11–21), the transition between childhood and adulthood, is one of the most dynamic periods of human development. Adolescence is characterized by dramatic physical, cognitive, social, and emotional changes. These changes, along with adolescents' growing independence, search for identity, concern with appearance, need for peer acceptance, and active lifestyles, can significantly affect their eating behaviors, weight, and nutrition status.

Rapid physical growth creates an increased demand for energy and nutrients. Practicing healthy eating behaviors during adolescence is essential for

- Promoting optimal growth, development, weight, and health
- Preventing immediate health problems (eg, iron-deficiency anemia, undernutrition, obesity, eating disorders, dental caries [tooth decay])
- Laying the foundation for lifelong health and reducing the risk for chronic diseases (eg, cardiovascular disease, type 2 diabetes mellitus, hypertension, some forms of cancer, osteoporosis)

Adolescence is divided into 3 stages. Early adolescence, ages 11 to 14, includes pubertal and cognitive changes. Middle adolescence, ages 15 to 17, is a time of increased independence and experimentation. During late adolescence, ages 18 to 21, adolescents make important personal and vocational decisions. These stages provide a useful context for understanding adolescents' eating behaviors and body image issues. The stages can also serve as a framework for providing adolescents with the information they need to practice healthy eating behaviors and be physically active.



GROWTH AND PHYSICAL DEVELOPMENT

The phenomenal growth that occurs during adolescence is second only to the growth that occurs during the first year of life and increases the body's demand for energy and nutrients. Total nutrition needs are greater during adolescence than at any other time in the life cycle. During this period, adolescents achieve the final 15% to 20% of their adult height, gain about 50% of their adult body weight, and accumulate up to 40% of their adult skeletal mass.[1] Nutrient needs parallel the rate of growth, with the greatest demands occurring during the peak period of growth (sexual maturity rating [SMR] 2–3 in females and 3–4 in males). For females, most physical growth is completed by about 2 years after menarche. (The mean age of menarche is age 12.5.) Males begin puberty about 2 years later than females, and they typically experience their major growth spurt and increase in muscle mass during middle adolescence.

Nutrition and physical activity are major determinants of adolescents' energy requirements and influence growth and body composition. Inadequate nutrition can delay sexual maturation, slow or stop linear growth, and compromise peak bone mass. Practicing

healthy eating behaviors and engaging in regular physical activity can help adolescents achieve normal body weight and body composition, thereby reducing their risk for obesity.

The changes associated with puberty can affect adolescents' satisfaction with their appearance. For males, the increased size and muscle development that come with physical maturation usually improve their body image. However, physical maturation among females may lead to dissatisfaction with their bodies, which may result in weight concerns and dieting.

Anticipatory guidance can help prepare adolescents and their parents for changes associated with puberty and help adolescents develop a positive body image. Because adolescents are interested in their own growth and development, this period presents health professionals with a key opportunity to discuss the importance of healthy eating behaviors, regular physical activity, and a positive body image.

Undernutrition compromises cognitive development, which affects learning, concentration, and school performance. Conversely, eating breakfast may improve cognitive function related to memory, test grades, and school attendance.[2]

DEVELOPMENT ISSUES

Cognitive capacities increase dramatically during adolescence. During early adolescence, adolescents have a growing capacity for abstract thought, but their thinking still tends to be concrete and oriented toward the present. During middle adolescence, they become more capable of problem-solving and abstract and future-oriented thinking. During late adolescence, they continue to refine their ability to reason logically and solve problems. The cognitive changes that occur during adolescence can facilitate healthy eating and regular physical activity, because adolescents are beginning to reflect on their behavior and understand its consequences.

Developing an identity and becoming an independent young adult are central to adolescence. Because foods can have symbolic meanings, adolescents may use them to establish individuality and express their identities.

Experimentation and idealism are common during middle adolescence. Adolescents may try fad diets and underestimate the associated health risks. Adolescents may adopt certain eating behaviors (eg, vegetarianism) to explore various lifestyles or to show concern for the environment. Adolescents are usually interested in new foods, including those from different cultures and ethnic groups. This can be a time to try new foods and learn cooking skills.

The social pressure to be thin and the stigma of obesity can lead to unhealthy eating behaviors and a poor body image. (See Tool I: Tips for Fostering a Positive Body Image Among Children and Adolescents.)

Adolescents spend a lot of time with their friends, and peer influence and group conformity are important. They may eat certain foods as a form of group identification. As adolescents strive for independence, they begin to spend more time away from home and thus eat more meals and snacks away from home. Although parents cannot control what their adolescents eat when they are away from home, they can make sure that healthy foods, such as fruits and vegetables, are available at home and limit the availability of high-calorie, low-nutrient foods, such as sweetened beverages and salty snacks.

Many adolescents go to stores and fast-food restaurants on their own and purchase foods with their own money. Snacks and fast foods can be high in calories, fat, and sugar, and their consumption should be limited. Parents can be positive role models by practicing healthy eating behaviors themselves. In addition, parents and health professionals can provide guidance to help adolescents make healthy food choices away from home.

HEALTHY LIFESTYLES

Adolescents can achieve substantial health benefits by doing physical activity for a total of 60 minutes or more each day. This should include aerobic activity as well as age-appropriate aerobic, muscle-strengthening, and bone-strengthening activities. It appears that the total amount of physical activity is more important for achieving health benefits than any one component

(frequency, intensity, or duration) or the specific mix of activities (aerobic, muscle-strengthening, or bone strengthening). Bone-strengthening activities remain especially important for adolescents because the greatest gains in bone mass occur during the years just before and during puberty. In addition, most peak bone mass is obtained by the end of adolescence.[3]

Adolescents who are physically active

- Have higher levels of cardiorespiratory fitness and stronger muscles
- Typically have less body fat
- Have stronger bones
- May have reduced symptoms of anxiety and depression

As adolescents grow and develop, their motor skills increase, giving them more opportunities for engaging in physical activity. By being physically active (eg, biking, hiking, playing baseball) with their adolescent, parents emphasize the importance of regular physical activity. When parents encourage adolescents to be physically active, adolescents' physical activity levels significantly increase.[4]

Because much of their physical activity occurs in group settings, adolescents' engagement in physical activity may be influenced by peers. Physical education at school should be provided every day, and a variety of enjoyable activities should be offered.

BUILDING PARTNERSHIPS

Healthy eating behaviors and regular physical activity promote adolescents' nutrition and weight status. Partnerships among health professionals, families, and communities are integral to developing nutrition and physical activity programs.

Schools can play a significant role in promoting healthy eating behaviors among adolescents. Nutrition education should be integrated within a comprehensive school health education program for adolescents. Schools can reinforce what is taught in the classroom by providing healthy foods. Foods sold at school (eg, in vending machines, at sports events, for fundraising) should be healthy. Federally funded school meal programs help provide adolescents with a substantial part of their daily nutrition requirements. (See Tool K: Federal Nutrition Assistance Programs.) Food shelves and pantries, community groups, and faith-based organizations can also provide food.

COMMON NUTRITION CONCERNS

Common nutrition concerns during adolescence include the following:

- Decrease in consumption of milk and other milk products
- Increase in consumption of sweetened beverages, especially soft drinks and sports drinks
- Insufficient intake of fruits and vegetables
- Higher consumption than recommended of foods high in fat, especially saturated and trans fats, cholesterol, and sodium
- Rise in overweight and obesity
- Low levels of physical activity
- Increase in eating disorders, body image concerns, dieting, and unsafe weight-loss methods
- Prevalence of iron-deficiency anemia (in females)
- Prevalence of hyperlipidemia
- Food insecurity among adolescents from families with low incomes

For a list of risk factors that can lead to poor nutrition status, see Tool D: Key Indicators of Nutrition Risk for Children and Adolescents. If there is evidence that an adolescent is at risk for poor nutrition, further assessment is needed, including a nutritional assessment, laboratory tests, or both.

Nutrition Supervision

An adolescent's nutrition and weight status should be evaluated during nutrition supervision visits or as part of health supervision visits. (For more information on health supervision, see *Bright Futures: Guidelines for Health Supervision of Infants, Children, and Adolescents,* Third Edition, listed under Suggested Reading in this chapter.) It is important to remember that nutrition supervision, which includes asking interview questions, conducting screening and assessment, and providing anticipatory guidance, should be used as appropriate and will vary from visit to visit and from adolescent to adolescent.

Health professionals begin nutrition supervision by selectively asking interview questions about the adolescent's nutrition status, to invite discussion and build partnerships. Use of the questions may vary from visit to visit and from family to family. Questions can be modified to match the health professional's communication style. Gathering information can also be accomplished by reviewing a questionnaire filled out by parents and/or the adolescent before the visit. (See Tool C: Nutrition Questionnaire for Adolescents Ages 11 to 21.) Additionally, to meet the challenge of providing nutrition supervision to diverse populations, health professionals need to appreciate the variety of cultural traditions related to food and the wide variation in food practices within and among cultural groups. (See the Cultural Awareness in Nutrition Services chapter.) Asking interview questions provides a useful starting point for identifying an adolescent's nutrition concerns.

Interview Questions

Eating Behaviors and Food Choices

FOR THE ADOLESCENT

- Which meals do you usually eat each day? How many snacks? How many times a week do you eat breakfast? Lunch? Dinner?
- How often does your family eat meals together?
- What do you usually eat and drink in the morning? Around noon? In the afternoon? In the evening? Between meals?
- What snacks do you usually eat?
- Are there any foods you won't eat? If there are, which ones?
- How often do you drink milk? What kind of milk do you drink (eg, whole milk, reduced fat [2%], low-fat milk [1%], fat-free [skim milk])? What other milk products do you like to eat?
- What fruits and vegetables, including juices, did you eat or drink yesterday?
- How often do you drink soft drinks, energy drinks, or sports drinks?
- What changes would you like to make in the way you eat?

FOR THE PARENT

- How often does your family eat meals together?
- Do you have any concerns about your teenager's eating behaviors?
- Do you think your teenager eats healthy foods? Why or why not?

Food Resources

FOR THE ADOLESCENT OR PARENT

- Who usually buys the food for your family? Who prepares it?
- Are there times when there is not enough food to eat or not enough money to buy food?

Weight and Body Image

FOR THE ADOLESCENT

- How do you feel about the way you look?
- Do you think that you weigh too little? Weigh too much? Are just the right weight? Why?
- How do you feel about your weight and height?
- Are you trying to change your weight? If so, how?
- How much would you like to weigh?
- Are you teased about your weight?

FOR THE PARENT

- How do you feel about your teenager's weight and height?

Physical Activity

FOR THE ADOLESCENT

- What do you do to be physically active? How often?
- How much time do you spend being active in a week?
- What physical activity would you like to do that you are not doing now? How can you make time for it?
- How much time do you spend each day watching television and playing computer or video games?
- What do you think you can do to be more active?

FOR THE PARENT

- What type of physical activity does your teenager engage in? How often?
- How much time does your teenager spend each day watching television or playing computer or video games?
- Does your teenager have a television in his bedroom?

Screening and Assessment

Growth and Physical Development

- Measure the adolescent's height and weight, and plot these on a standard growth chart. Deviation from the expected growth pattern (eg, a major change in growth percentiles on the chart) should be evaluated. This may be normal or may indicate a nutrition problem (eg, difficulties with eating).
- Height and weight measurements can be used to indicate nutrition and growth status. Changes in weight reflect an adolescent's short-term nutrient intake and serve as general indicators of nutrition status and overall health. Low height-for-age may reflect long-term, cumulative nutrition or health problems.
- Body mass index (BMI) is used as a screening tool to determine nutrition status and overall health. Calculate the adolescent's BMI by dividing weight by the square of height (kg/m^2) or using a BMI wheel or calculator. To interpret BMI, plot the adolescent's BMI and age on a BMI-for-age growth chart to determine the adolescent's BMI percentile.
- Some adolescents have a high BMI because of a large, lean body mass resulting from physical activity, muscularity, or frame size. An elevated skinfold (ie, above the 95th percentile on Centers for Disease Control and Prevention [CDC] growth charts) can confirm excess body fat in adolescents.
- Evaluate the appearance of the adolescent's skin, hair, teeth, gums, tongue, and eyes.
- Obtain the adolescent's blood pressure. (See the Hypertension chapter.)
- Assess the adolescent's risk for familial hyperlipidemia. (See the Hyperlipidemia chapter.)

Table 1 provides an overview of indicators of height and weight status. When an adolescent is outside the healthy weight range, a more in-depth assessment may be needed. Body mass index serves only as a screening tool and should not be used as a diagnostic tool.

Stunting

- Adolescents whose height-for-age is below the third percentile should be evaluated. Stunting reflects a failure to reach optimum height as a result of poor nutrition or poor health.[5] However, most adolescents with low height-for-age are short as a result of genetics, not because their growth is stunted. Stunting has been reported in adolescents with severely inadequate energy intake or chronic illnesses. The goal is to identify adolescents whose growth is stunted and who may benefit from improved nutrition or treatment of other

TABLE 1. INDICATORS OF HEIGHT AND WEIGHT STATUS

Indicator	Anthropometric Variable	Cut-Off Values
Stunting	Height-for-age	<3rd percentile
Underweight	BMI-for-age	<5th percentile
Healthy weight	BMI-for-age	≥5th–84th percentiles
Overweight	BMI-for-age	≥85th–94th percentiles
Obesity	BMI-for-age	≥95th percentile

Sources: World Health Organization,[5] Barlow et al,[6] and Krebs et al.[7]

underlying problems. Adolescents with special health care needs may have low height-for-age because of a genetic disorder, chronic eating problems, an altered metabolic rate, malabsorption syndrome, or other conditions. All of these factors should be assessed, and interventions should be implemented to help adolescents reach the height that they have the potential to achieve. A referral to an endocrinologist may be necessary to rule out growth hormone or thyroid deficiency.

Underweight

- Adolescents with a BMI below the fifth percentile should be assessed for organic disease and eating disorders. Adolescents may be thin naturally, or they may be thin as a result of inadequate energy intake, inadequate food resources, restrictive dieting, a nutritional deficit, or a chronic disease.

Overweight

- Adolescents with a BMI between the 85th and 94th percentiles are considered overweight and need further screening.[6] (See the Obesity chapter.)

Obesity

- Adolescents with a BMI at or above the 95th percentile are considered obese and need an in-depth medical assessment.[7] Adolescents with a BMI above the 99th percentile are at highest risk for comorbidities associated with excessive weight. However, there is no consensus on a definition of severe obesity in adolescents. The expert committee suggested using the 99th percentile based on cutpoints from National Health and Nutrition Examination Survey data.[8] These cutpoints may be imprecise, but adolescents with a BMI at or above this level are at higher risk for comorbidities compared with adolescents with BMIs in the normal range, and therefore intervention is urgent. (See the Obesity chapter.)

Iron-Deficiency Anemia

- Recommendations for iron-deficiency anemia screening have been put forth by the American Academy of Pediatrics (AAP) and CDC. (See the Iron-Deficiency Anemia chapter.)

FOR ADOLESCENT FEMALES AGES 12 TO 21

- The AAP recommends screening adolescent females during all routine physical examinations.[9]
- The CDC recommends annually screening adolescent females with known risk factors for iron-deficiency anemia (eg, extensive menstrual or other blood loss, low iron intake, a previous diagnosis of iron-deficiency anemia). For those with no known risk factors, the CDC recommends screening every 5 to 10 years during routine physical examinations.[10]

FOR ADOLESCENT MALES AGES 12 TO 18

- The AAP recommends screening adolescent males during their peak growth period during routine physical examination.[9]
- The CDC recommends screening adolescent males with known risk factors for iron-deficiency anemia (eg, low iron intake, special health care needs, previous diagnosis of iron-deficiency anemia).[10]

Oral Health

- Ask whether the adolescent has regular dental visits.
- Assess eating behaviors (eg, frequency of consuming foods and beverages high in sugar) to determine the adolescent's risk for dental caries (tooth decay). (See the Oral Health chapter.)

Physical Activity

- Assess the adolescent's level of physical fitness by
  - Asking how much physical activity the adolescent engages in on a weekly basis
  - Evaluating how the adolescent's physical fitness compares with national standards (eg, how well the adolescent did on the school's standardized physical fitness assessment)
- For physical activity characteristics associated with an increased likelihood of poor nutrition, see Tool D: Key Indicators of Nutrition Risk for Children and Adolescents. If there is evidence of nutrition risk, further assessment is needed, including a nutritional assessment and/or laboratory tests.
- Screen for the amount of time the adolescent spends watching television and on other media activities, such as computer or video games. Ask whether the adolescent watches television during mealtimes.

Anticipatory Guidance

Anticipatory guidance should address the adolescent's and parents' nutrition concerns. In addition, health professionals should offer information on the adolescent's nutrition status; make the adolescent and parents aware of what to expect as the adolescent enters the next developmental period; and promote a positive attitude about eating behaviors, food choices, and physical activity. (For additional information, see Tool F: Stages of Change—A Model for Nutrition Counseling, and Tool G: Strategies for Health Professionals to Promote Healthy Eating Behaviors.)

Growth and Physical Development

- Explain the standard growth chart to adolescents and their parents, and show them how they compare to other adolescents their age. Discuss upcoming physical changes and specific concerns. Emphasize that a healthy body weight is based on a genetically determined size and shape rather than on an ideal, socially defined weight. A healthy body weight can be achieved by practicing healthy eating behaviors, limiting intake of beverages high in sugar (eg, soft drinks), and being physically active. Explain the importance of energy balance and watching portion sizes. (See Tool I: Tips for Fostering a Positive Body Image Among Children and Adolescents.)
- Help adolescents understand and accept normal physical changes (eg, weight changes; the widening of females' hips and fat accumulation in their bodies; the large variation in height, weight, and growth rates among adolescents).

FOR EARLY ADOLESCENCE: AGES 11 TO 14

- Discuss that adolescent females' physical growth and development may lead to dissatisfaction with their appearance. Reassure them that fat accumulation in the hips, thighs, and buttocks is normal during adolescence (from 15%–18% of body weight before puberty to 20%–25% at the end of puberty).[1]
- Discuss that adolescent males may experience a slight weight gain before their growth spurt (ie, increase in height), which occurs between ages 9 and 13. In addition, their body fat percentage decreases during their growth spurt (SMR 3–4). After puberty, their body fat percentage increases, and by age 18, it is about 15% to 18% of their body weight. Reassure adolescent males and their parents that fat gain is normal and will probably level off during the upcoming growth spurt.[1]

FOR MIDDLE ADOLESCENCE: AGES 15 TO 17

- Reassure late-maturing adolescent males that they are normal. Use charts that plot height velocity by age and SMR to ease their concerns.

FOR LATE ADOLESCENCE: AGES 18 TO 21

- Explain the standard growth chart to adolescents, and show them how they compare to other adolescents their age. Discuss any specific concerns.

Eating Behaviors and Food Choices

- Discuss healthy eating behaviors, ways to achieve them, and the importance of not skipping meals. Encourage healthy food choices based on the *Dietary Guidelines for Americans*[11] and *MyPyramid*.[12] (See the Healthy Eating and Physical Activity chapter.)
- Explain that energy (calorie) requirements increase greatly during adolescence and are influenced by growth status, physical activity level, and body composition (Table 2).
- Encourage adolescents to drink 3 cups of low-fat (1%) or fat-free (skim) milk or consume the equivalent from other milk products (eg, yogurt, cheese) per day to meet their calcium needs, because bone density increases well into young adulthood (the 20s). Eating foods that provide enough calcium, such as milk, yogurt, and cheese, to attain maximum bone density helps prevent osteoporosis and bone fractures later in life.
- Tell parents that to prevent rickets and vitamin D deficiency, adolescents who do not obtain 400 IU/day of vitamin D through vitamin D–fortified milk (100 IU per 8-oz serving) and vitamin D–fortified foods (eg, fortified cereals, eggs [yolk]) should receive a vitamin D supplement of 400 IU/day.[13]

TABLE 2. ESTIMATED CALORIE REQUIREMENTS (IN KILOCALORIES) FOR EACH GENDER AND AGE GROUP AT 3 LEVELS OF PHYSICAL ACTIVITY[11]

Gender	Age (years)	Sedentary[a]	Moderately Active[b]	Active[c]
Female	9–13	1,600	1,600–2,000	1,800–2,200
	14–18	1,800	2,000	2,400
	19–30	2,000	2,000–2,200	2,400
Male	9–13	1,800	1,800–2,200	2,000–2,600
	14–18	2,200	2,400–2,800	2,800–3,200
	19–30	2,400	2,600–2,800	3,000

[a]Sedentary means a lifestyle that includes only the light physical activity associated with typical day-to-day life.
[b]Moderately active means a lifestyle that includes physical activity equivalent to walking about 1.5 to 3 miles per day at 3 to 4 miles per hour, in addition to the light physical activity associated with typical day-to-day life.
[c]Active means a lifestyle that includes physical activity equivalent to walking more than 3 miles per day at 3 to 4 miles per hour, in addition to the light physical activity associated with typical day-to-day life.

- Explain to parents that the quality of the diet often decreases from childhood through adolescence because adolescents are more independent and make their own food choices. Encourage parents to provide a variety of healthy foods at home; limit the availability of high-calorie, low-nutrient foods; and make family mealtimes a priority. Eating family meals together provides parents an opportunity to model healthy eating behaviors and to promote communication.
- Encourage adolescents to limit foods high in fat, especially those high in saturated and trans fats (eg, chips, french fries) and foods (eg, candy, cookies) and beverages (eg, fruit drinks, soft drinks) high in sugar.
- Encourage adolescents to choose healthy foods at home and when eating away from home.
- Many adolescent females begin to diet after the onset of puberty. Early-maturing females are more likely to diet shortly after puberty than those who mature later. Overweight adolescent females are also more likely to diet and use unhealthy weight-loss practices. Discuss safe and healthy ways to achieve and maintain a healthy body weight.

Oral Health

- Encourage the adolescent to drink water when thirsty and to limit intake of beverages high in sugar (eg, juice, juice drinks, soft drinks).
- Encourage the adolescent to brush his or her teeth with fluoridated toothpaste twice a day (after breakfast and before bed).
- Tell adolescents that limiting their consumption of foods (eg, candy, cookies) and beverages (eg, juice, juice drinks, soft drinks) high in sugar can help prevent dental caries (tooth decay).
- Explain that drinking fluoridated water is a safe and effective way to significantly reduce the risk for tooth decay in adolescents. (See the Oral Health Chapter.) For families that prefer bottled water, a brand in which fluoride is added at a concentration of approximately 0.8 to 1.0 mg/L (ppm) is recommended.[14]

Weight and Body Image

- Emphasize that a healthy body weight is based on a genetically determined size and shape rather than on an ideal, socially defined weight.
- A healthy body weight can be achieved by practicing healthy eating behaviors, limiting intake of beverages high in sugar (eg, fruit drinks, soft drinks), and being physically active. Explain the importance of energy balance and watching portion sizes.
- Discuss healthy and safe ways for adolescents to achieve and maintain a healthy weight (eg, by practicing healthy eating behaviors; limiting high-calorie, low-nutrient foods and beverages; engaging in regular physical activity; reducing sedentary behaviors).[15] Discourage dieting; instead, emphasize a healthy lifestyle.
- Help the adolescent build a positive body image by explaining that people come in unique sizes and shapes, within a range of healthy body weights. Adolescents need to know that they are loved and accepted as they are, regardless of their size and shape. (See Tool I: Tips for Fostering a Positive Body Image Among Children and Adolescents.)

Physical Activity

- Encourage the adolescent to engage in 60 or more minutes of daily physical activity. Explain to the adolescent the following guidelines:[3]
  - Aerobic: Most of the 60 or more minutes a day should be either moderate-intensity (eg, hiking, skateboarding) or vigorous-intensity (eg, running, bicycling) aerobic physical activity and should include vigorous-intensity physical activity at least 3 days a week.
  - Muscle-strengthening: As part of the 60 or more minutes of daily physical activity, adolescents should include muscle-strengthening physical activity (eg, climbing trees, sit-ups) at least 3 days a week.
  - Bone-strengthening (weight-bearing): As part of their 60 or more minutes of daily physical activity, adolescents should include bone-strengthening physical activity (eg, jumping rope, playing basketball) at least 3 days a week.
- Encourage adolescents with special health care needs to engage in regular physical activity for cardiovascular fitness (within the limits of the adolescent's medical or physical conditions). Explain that adaptive physical education is often helpful and that a physical therapist can help identify appropriate activities. (See the Children and Adolescents With Special Health Care Needs chapter.)
- Emphasize the importance of wearing safety equipment (eg, helmets, pads, mouth guards, goggles) when the adolescent is physically active.
- If the safety of the environment or neighborhood is a concern, help adolescents find other settings for physical activity.
- Engagement in physical activity declines dramatically during early adolescence, especially in females. Help adolescents incorporate regular physical activity into their daily lives (eg, through physical education at school and activities with family and friends).
- Encourage adolescents to drink plenty of water when they are physically active.
- Explain to parents about the effects of television and media viewing. Encourage them to turn off the television during mealtimes and not to have a television in the adolescent's bedroom. Tell parents to limit the adolescent's total entertainment media time (eg, watching television, playing computer or video games) to no more than 1 to 2 hours of quality programming a day.[16]
- Encourage adolescents, especially those who are overweight, to reduce sedentary behaviors (eg, watching television, playing computer or video games).

Substance Use

- Discourage adolescents from consuming excessive quantities of caffeinated beverages (eg, soft drinks, coffee, energy drinks).
- Warn adolescents about the dangers of using alcohol, tobacco, and other drugs.
- Warn adolescents about the dangers of using performance-enhancing products (eg, protein supplements, anabolic steroids).

The desired outcomes for the adolescent and the role of the family outlined in Table 3 can assist health professionals in promoting optimal nutrition.

TABLE 3. DESIRED OUTCOMES FOR THE ADOLESCENT, AND THE ROLE OF THE FAMILY

	Educational/Attitudinal	Behavioral	Health
Desired Outcomes for the Adolescent	Understands that healthy eating behaviors and regular physical activity are crucial to growth, development, weight, and health Understands the importance of eating a variety of healthy foods and appropriate serving sizes Understands the importance of family meals Understands the physical, emotional, and social benefits of regular physical activity and how to increase physical activity level Understands that people come in unique body sizes and shapes, within a range of healthy body weights Understands safe ways to achieve and maintain a healthy body weight, and recognizes the dangers of unsafe weight-loss and weight-gain methods	Consumes a variety of healthy foods Limits intake of high-calorie, low-nutrient foods and beverages Makes healthy food choices at and away from home Seldom skips meals, and does not practice restrictive or disordered eating behaviors Engages in physical activity on most, if not all, days of the week Watches television or plays computer or video games no more than 1 to 2 hours of quality programming a day Does not have a television in his bedroom	Maintains optimal nutrition to promote growth and development Achieves nutritional and physical well-being, without signs of iron-deficiency anemia, undernutrition, obesity, eating disorders, dental caries, or other nutrition-related problems Achieves and maintains a healthy body weight and positive body image
Role of the Family	Understands the nutrition needs of the growing adolescent Understands physical changes that occur with growth and development Understands the relationship between nutrition and short- and long-term health Understands the importance of a healthy diet consisting of 3 meals per day and snacks as needed Understands that people come in unique body sizes and shapes, within a range of healthy body weights Understands the dangers of unsafe weight-loss methods, and knows safe ways to achieve and maintain a healthy weight	Provides a positive role model: practices healthy eating behaviors, engages in regular physical activity, and promotes a positive body image Provides a variety of healthy foods at home, limiting the availability of high-fat and high-sugar foods Eats meals together regularly to ensure optimal nutrition and to facilitate family communication Provides opportunities for the adolescent to participate in meal planning and food preparation Uses community nutrition programs and food resources if needed Engages in regular physical activity with the adolescent	Provides developmentally appropriate, healthy foods, and modifies them if necessary Helps the adolescent achieve and maintain a healthy weight Provides opportunities and safe places for the adolescent to be physically active

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A Dancer's Dream

Middle-schooler Katherine Gomez loves to dance and has been taking lessons since she was 5. Katherine has dreamed of being on her school's dance team, and now, as a seventh-grader, she can try out for the team. Katherine's mother is concerned that Katherine appears "chunky" and thinks that she will probably need to slim down if she is going to have a chance of making the team. Mrs Gomez asks their physician, Dr Meyer, for a diet for Katherine.

Dr Meyer measures Katherine's weight and height and determines her BMI. He assures Katherine and Mrs Gomez that Katherine's weight and height are within the normal range for her age. He also asks Katherine about her eating behaviors and determines that they are appropriate. Dr Meyer advises Katherine to eat 3 meals a day and to eat nutritious snacks when she is hungry. He suggests that she eat a wide variety of foods and choose fruits, vegetables, and low-fat and fat-free milk products as snacks rather than chips, candy, and soft drinks.

Dr Meyer realizes that Katherine and her mother need additional information and guidance on anticipated physical changes and nutrition needs during adolescence.

Dr Meyer realizes that Katherine and her mother need additional information and guidance on anticipated physical changes and nutrition needs during adolescence. He refers them to a dietitian for follow-up. He also makes a note in Katherine's chart to evaluate her height, weight, diet, and food intake during her next visit.

Frequently Asked Questions About Nutrition in Adolescence

How can I encourage my teenager to eat healthy foods?

- Serve new foods and regional and ethnic foods.
- Shop for foods and cook together.
- Be a positive role model—practice healthy eating behaviors yourself.
- Don't fight over food with your teenager, and do not prepare separate foods for him.
- Keep a variety of healthy foods in the house. Limit the availability of foods (eg, candy, cookies) and beverages (eg, soft drinks) high in sugar and fat, especially saturated and trans fats.
- Plant a garden.

How can our family eat healthy meals together when we are so busy?

- Make food preparation and cooking an enjoyable family activity.
- Make simple meals (eg, salads, soups, sandwiches).
- Eat different meals together. For example, eat breakfast together one day and lunch or dinner the next.
- Buy healthy ready-to-eat foods from the store or healthy take-out foods from a restaurant.
- When your family eats together, use the time to socialize. Avoid distractions. Turn the television off, and don't answer the telephone.
- Try to prioritize family meals and strive to eat 4 meals (breakfast, lunch, or dinner) together a week.

How can I get my teenager to eat breakfast?

- Provide foods that are fast and convenient, (eg, bagels, low-fat granola bars, fruits, 100% fruit juice [limit to 6–8 oz per day], yogurt).
- Serve foods other than the usual breakfast foods (eg, sandwiches, baked potatoes, leftovers such as chicken or pasta).
- Help your teenager get organized so that she has time to eat in the morning.
- Make breakfast the night before.
- If your teenager is in a hurry, offer her foods such as fruits or trail mix to eat at school.
- See if your school offers a breakfast program.

How can I get my teenager to eat more fruits and vegetables?

- Keep a variety of fruits and vegetables at home.
- Put cut-up fruits and vegetables on the counter when you know your teenager will be hungry.
- Wash and cut up fruits and vegetables and keep them in the refrigerator, along with low-fat dip or salsa. Use a clear container so that the fruits and vegetables can be seen easily.
- Serve 2 or more vegetables with dinner, including at least one your teenager likes. Serve a salad with a choice of low-fat dressing.
- Use plenty of vegetables in soups, sauces, and casseroles.
- Pack fruits and vegetables in your teenager's bag to eat at school.
- Offer a variety of fruits and vegetables at meals and snacks, but don't force your teenager to eat them.
- Plant a garden.
- Be a good role model—eat more fruits and vegetables yourself.

How can I help my teenager get enough calcium?

- Serve foods that are rich in calcium, such as low-fat (1%) or fat-free (skim) milk products (eg, milk, cheese, cottage cheese, yogurt), tofu processed with calcium sulfate, broccoli, and collard and turnip greens.
- Use low-fat or fat-free milk products in recipes (eg, in puddings, milkshakes, soups, casseroles).
- If your teenager's digestive system cannot handle milk and milk products (ie, he is lactose intolerant), try these suggestions
  - Serve small portions of these foods throughout the day.
  - Serve these foods along with non-milk products.

- Serve lactose-free milk products, including milk and yogurt, and aged hard cheeses (eg, cheddar, Colby, Swiss, Parmesan) that are low in lactose. Add lactose drops to your teenager's milk.
- Give your teenager lactase tablets before he eats milk products containing lactose.
- Serve foods, such as 100% fruit juice and cereal products, with added calcium (calcium-fortified).
- If these ideas do not work, talk to a health professional about giving your teenager a calcium supplement.

My teenager has become a vegetarian. Should I be concerned?

- With careful planning, a vegetarian lifestyle can be healthy and meet teenagers' nutritional needs.
- A vegetarian diet that includes milk products and eggs usually provides adequate nutrients; however, your teenager may need to take an iron supplement.
- Vegans are strict vegetarians who don't eat any animal products, including dairy foods, eggs, and fish. They may need additional calcium, vitamin B_{12}, and vitamin D, which can be provided by fortified foods and supplements.
- Instead of always preparing separate vegetarian meals for your teenager, occasionally fix vegetarian meals for the whole family.
- Ask a registered dietitian or nutritionist to help you plan healthy meals.

How can I teach my teenager to make healthy food choices away from home?

- Encourage your teenager to make healthy food choices when purchasing food at school, stores, and restaurants, and from vending machines.
- Review school and restaurant menus with your teenager, and discuss healthy food choices and appropriate portions. Find foods that are low in fat, sugar, and calories.
- Encourage your teenager to eat salads with low-calorie dressings, fruits, vegetables, and broiled or baked meats.
- Encourage your teenager to avoid eating fried foods or to reduce serving sizes (eg, by splitting an order of french fries with a friend).
- Teach your teenager to ask for changes to make foods healthier, such as asking the server to "hold the mayonnaise."

My teenager snacks on chips and candy. What should I do?

- Limit foods in your home that are high in fat, such as potato chips that are fried, and foods that are high in sugar, such as candy and sweetened beverages (eg, juice drinks, soft drinks).
- Keep a variety of easy-to-prepare and healthy foods on hand.
- Serve healthier foods (eg, whole-grain low-fat products, 100% fruit juice [limit to 6–8 oz per day], fruit, applesauce, vegetables, yogurt).
- Wash and cut up vegetables, and keep them in a clear container (so they can be seen easily) in the refrigerator, along with low-fat dip or salsa. Keep them at your teenager's eye level so they are the first thing he sees when he opens the fridge.
- Keep a bowl of fruit on the kitchen table or counter.
- Encourage your teenager to make healthy food choices when purchasing food at school, stores, and restaurants, and from vending machines.

How can I help my teenager be more active?

- Encourage spur-of-the-moment physical activity (eg, dancing to music).
- Limit your teenager's total entertainment media time (eg, watching television, playing computer or video games) to no more than 1 to 2 hours of quality programming a day. Don't put a television in your teenager's bedroom; if one is already there, remove it.
- For every hour your teenager reads, watches television, or plays computer or video games, encourage her to take a 10-minute physical activity break.
- Involve your teenager in family chores (eg, raking leaves, walking the dog).
- Make physical activity a part of your teenager's daily life. For example, use the stairs instead of taking an elevator or escalator, and walk or ride a bike instead of riding in a car.
- Encourage your teenager to enroll in planned physical activities, such as swimming, martial arts, or dancing.
- Be physically active together (eg, biking, playing ball, dancing, skating). It's a great way to spend time with your teenager.
- Take turns selecting physical activities that family members and friends can do together.

- Plan at least one special physical activity (eg, a hike, a bike ride) each week.
- Be a good role model—be physically activity yourself.

What should I do if my teenager is overweight?

- If you are concerned about your teenager's weight, bring this to the attention of your teenager's health professional, and request an evaluation of your teenager's BMI.
- Never place your teenager on a diet to lose weight unless a health professional recommends one for medical reasons and supervises it.
- Focus on gradually changing the entire family's eating and physical activity behaviors.
- Serve healthy meals and snacks at scheduled times, but allow for flexibility.
- Limit foods (eg, candy, cookies) and beverages (eg, juice drinks, soft drinks) high in sugar and high-calorie, low-nutrient snacks.
- Limit most beverages to low-fat (1%) or non-fat (skim) milk, water, and 100% fruit juice (limited to 6 oz per day).
- Serve low-fat or non-fat milk products.
- Do not forbid sweets and desserts. Serve them in moderation.
- Look at school menus with your teenager, and discuss healthy food choices and appropriate portions.
- Plan family activities that everyone enjoys (eg, hiking, biking, swimming).
- Limit to 1 to 2 hours per day the amount of time your teenager watches television and plays computer games.
- Be a good role model—practice healthy eating behaviors and be physically active yourself. Teenagers need at least 60 minutes of moderate to vigorous activity each day.
- Work with your community to make sure that your teenager has safe places for being physically active (eg, walking and biking paths, playgrounds, parks).
- Do not make negative comments about your teenager's weight or allow other family members to tease the teenager about weight.

How can I help my underweight teenager gain weight?

- Limit the quantity of beverages your teenager drinks between meals if his appetite is being affected.
- Encourage your teenager to eat a midmorning snack at school, if possible, and an after-school snack. Limit snacks close to mealtimes if snacking is affecting his appetite.
- Have your teenager help with meal planning and food preparation.
- Continue to offer foods even if your teenager has refused to eat them before. Your teenager is more likely to accept these foods after they have been offered several times.

How can I help my teenager like her body?

- Teenagers are very sensitive about how they look. Do not criticize your teenager about her size or shape.
- Focus on traits other than appearance when talking to your teenager.
- Talk to your teenager about how the media affects his body image.
- Be a good role model—don't criticize your own size or shape or that of others.

If you notice any of these symptoms, talk to a health professional about your concerns.

ANOREXIA NERVOSA

- Excessive weight loss in a short period
- Continuation of dieting although thin
- Dissatisfaction with appearance; belief that body is fat even though extremely thin
- Loss of menstrual period
- Unusual interest in certain foods and development of unusual eating rituals
- Eating in secret
- Obsession with exercise
- Depression

BULIMIA NERVOSA

- Loss of menstrual period
- Unusual interest in certain foods and development of unusual eating rituals
- Eating in secret
- Obsession with exercise

- Depression
- Binge-eating
- Binge-eating with no noticeable weight gain
- Vomiting or laxative use
- Disappearance into bathroom for long periods (eg, to induce vomiting)
- Alcohol or drug abuse

RESOURCES FOR FAMILIES

Centers for Disease Control and Prevention. Division of Nutrition, Physical Activity and Obesity. http://www.cdc.gov/nccdphp/dnpa

Centers for Disease Control and Prevention. *Eat a Variety of Fruits & Vegetables Every Day.* http://www.fruitsandveggiesmatter.gov

International Food Information Council. *Kidnetic.* http://www.kidnetic.com

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